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ABSTRACT

This report contains the evaluation and assessment of the impact of six experimental projects funded by the National Science Foundation in 1974 and 1975 to increase the number of women pursuing science-related careers. The projects are assessed both individually and as a whole. The projects were conducted at the following institutions: University of Kansas; Policy Studies in Education; Queensborough College; University of Missouri at Kansas City; Rosemont College; and Massachusetts Institute of Technology. Chapter 1 describes the evaluation methodology, including assessment of project documents, site visits, and a participant impact survey. Chapter 2 contains a synopsis of each of the projects, and Chapter 3 contains the interim program recommendations. Chapter 4 discusses the psychological, sociological, and institutional barriers to the participation of women in science-related careers. Possible interventions or treatments that might be used are proposed and categorized by educational level. The appendices contain samples of the evaluation collection sheet used, and the participant impact survey. Also included are a bibliography of selected programs similar to the NSF projects, a film bibliography, and a selected annotated bibliography of the literature. (Author/MH)

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REPORT

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AN IMPACT ANALYSIS OF SPONSORED PROJECTS TO INCREASE THE PARTICIPATION OF WOMEN IN CAREERS IN SCIENCE AND TECHNOLOGY

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Interim Technical Report
Contract #NSF-C1053

AN IMPACT ANALYSIS OF SPONSORED PROJECTS TO INCREASE THE PARTICIPATION OF WOMEN IN CAREERS IN SCIENCE AND TECHNOLOGY

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June 30, 1976

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EXECUTIVE SUMMARY

This interim report contains the evaluation and assessment of the impact of six experimental projects funded by the National Science Foundation in FY 1974 and FY 1975 to increase the number of women pursuing science-related careers. The report assesses both the individual projects and the collection of projects as a whole. The projects were conducted at: University of Kansas, Policy Studies in Education, Queensborough College, the University of Missouri at Kansas City, Rosemont College, and Massachusetts Institute of Technology. The final report will contain the evaluation and assessment of funded projects for which there is not sufficient information to include at this time. These projects are at: Goucher College, two projects from Michigan Tech, Mary Baldwin College, the University of Oklahoma, and American College Testing.

Chapter I describes the methodology that Denver Research Institute used to conduct the evaluation. The methodology included assessment of project documents, site visits, a participant impact survey, and an evaluation form completed by both DRI and the project directors. The chapter also describes the difficulty in conducting the evaluation because of the many different internal evaluation instruments developed and used by the projects. None of these instruments was adequately validated. In addition, the design of some of the internal evaluations was not adequate to permit definitive conclusions.

Chapter II contains a synopsis of each of the projects. Each synopsis contains a description of the project as it was originally conceived, the project as it was actually implemented, obstacles to project implementation, a description of project personnel including role models, a report of the primary outcomes described in project documents, the data obtained by the participant impact survey, and observations derived from the site visits. Each synopsis also contains a section on the secondary impacts of the project, the materials developed as the project product, and the dissemination strategies employed by project personnel. It also contains a section on project costs, including the estimated cost to reuse the curriculum products in other settings, and recommendations and conclusions.

The third chapter contains the interim program recommendations. The first recommendation is that given the emphasis on professional careers in science, concentration on high ability women is a realistic restriction. Second, the more able and/or more mature women appear to be more interested in content of the vocation, while younger or less able women are more interested in lifestyle possibilities relevant to any career. A trade-off between age and ability was noted; and increase in ability level may decrease the appropriate age. The third recommendation was that the programs concentrate on women who have already shown an interest in science and have the prerequisite background after the junior year

in high school. It was also recommended that a distinction between career education and programs to interest women in science-related careers be made. The general conclusion was that recruitment and commitment should be emphasized in high school years; reinforcement, support and retention be emphasized in the college years, and that removing institutional barriers should be emphasized in graduate school, reentry programs for mature women, and post-employment programs. It was concluded that most of the participants felt strongly that all-female workshops and classes were necessary under certain conditions.

Another general conclusion was that role models appeared to be the most effective component of most of the projects. It was recommended that a mixture of role models, closer in age and accomplishment level to the participants be utilized in conjunction with inspirational models, successful women at the top of their fields. It was also suggested that reentry programs might be more successful in recruiting underemployed, rather than unemployed, women. Another recommendation was that the National Science Foundation develop a strategy to disseminate the curriculum materials of each of the projects. It was also suggested that the Foundation take the responsibility for making evaluation instruments of established reliability and validity available to the project directors, and providing technical assistance in their internal evaluation efforts. A conference of all federal agencies involved in career education was also recommended to provide a means to pool available resources, and to avoid duplication of effort. Finally, it was recommended that the Foundation continue its activities in encouraging women to choose science as a career and to disseminate knowledge about the existence of its programs.

The fourth chapter is concerned with alternative interventions. It begins with a list of psychological, sociological and institutional barriers to the participation of women in science-related careers. Some assumptions are delineated, and different kinds of interventions or treatments that might be used are proposed. Each of the possible interventions is categorized by educational level; e.g., elementary school, high school, college, graduate school, reentry and post employment programs.

The appendices contain a sample of the evaluation collection sheet used by DRI, a sample of the participant impact survey and the cover letter accompanying it; a bibliography of selected programs similar to the NSF projects, a film bibliography, a selected bibliography of the literature, and a selected annotated bibliography of the literature.

CHAPTER I
INTRODUCTION

According to the NSF Bulletin (E-74-1) announcing the educational programs for the fiscal year 1974, among the program goals were "increasing the flow of women into careers in science" and "discovering effective mechanisms for increasing participation of women in scientific careers."

The National Science Foundation funded eight experimental projects in 1974 in an effort to meet these objectives. Projects had budgets ranging from $20,000 to about $50,000. The educational level of the women they addressed ranged from the secondary level to college, and postgraduate/reentry age groups. Each approach was somewhat unique. This report contains an evaluation of four of these projects* and one funded in fiscal 1975.

The program strategy chosen by NSF was to fund a small number of disparate projects, to assess their effectiveness, and to utilize the results in future planning. While this is a viable and cost-effective approach, especially in areas where little is known about effective programs or mechanisms, it presents many difficulties for the evaluators of those programs.

Because of the desire on the part of NSF to have feedback as quickly as possible upon which to base their future program decisions, most of the projects were funded for a one-year period and were required to have an "internal evaluation" component. This "internal evaluation" most frequently translated into an experimental/control group design. The most reliable measure of effectiveness is an actual increase in the number of women pursuing science-related careers. However, this dependent measure is not viable for a one-year project since the participant's appearance in the labor force may be four to ten years in the future. Therefore, the majority of the projects choose some measure of attitude or knowledge change over the year period, or an interim behavioral measure, e.g., science course, declared major, etc.** Further, no validated instrument exists designed to reflect changes in career options, awareness of career potential and/or career plans. Consequently, the majority of the project directors were forced to design their own evaluation instruments or attitude questionnaires. This situation was disadvantageous for both the project directors and the evaluators. First, validating a questionnaire and assessing its reliability is a complex, arduous, and expensive

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*Those completed as of this date.

**Several of the projects are conducting long-term tracking at their own expense.

undertaking that requires considerable sophistication in the rather narrow area of testing. Second, with a pre- and post-test design even the most reliable and valid attitude measures frequently fail to reflect changes in attitudes because of "sleeper" effects or other variables. Even then, reported attitude changes may not be translated into behavioral changes. Third, many different and unvalidated self report instruments were used to develop dependent measures. For all these reasons, the project evaluations or experimental outcomes cannot be considered definitive.

Another factor limiting the Denver Research Institute evaluation effort was frequently a less than adequate design and analysis of the experimental intervention. Almost without exception the project directors appeared very committed to and well versed in women's problems and science subject matter. Most, however, did not have extensive experience in project evaluation and/or experimental procedures. Given the desire of NSF to produce "hard results," one possible remedy to this situation may have been for the Foundation to provide guidelines for data collection to the project directors or to provide technical assistance in their evaluation efforts.

The task of Denver Research Institute, then, has been to compare "apples and oranges," e.g., different experimental treatments measured by idiosyncratic instruments which have no reported reliability/validity data. Since the typical project did not result in statistically significant results, the evaluation team has had to resort to more subjective judgment than proposed. This judgment has covered the outcomes, and impacts, project personnel and processes, and project materials.

Methodology

The information for the evaluation effort was collected several different ways. Copies of all the documents produced by project personnel were studied. Site visits were made to most of the projects. During the site visit, the evaluation team interviewed project personnel, participants, role models and consultants. After the site visit, the team completed the form outline given in Appendix A. The form was slightly modified and sent to project directors to complete in order to verify the evaluation teams' perceptions and/or to correct any erroneous conclusions, as well as to provide data the team may have omitted.*

In an attempt to "standardize" the outcome measures of the projects, the evaluation team sent out a short independent "participant impact survey" to the project participants whose names were provided

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*The form has currently only been returned by Dr. Smith of the University of Kansas, and Dr. Newton of Policy Studies in Education.

by the project directors. A copy of the postcard survey and a sample cover letter are given in Appendix B. While the results of the survey are given for most of the projects, the list of names given was frequently incomplete, and a number of the addresses had been changed. Further, the participants who responded may have represented a biased sample. Therefore, the results of the survey are compared with the experimental outcomes and impressions formed during the site visits in an attempt to offset the limitations of each of the three methods of data collection.

Organization of the Report

This report contains a synopsis of each of the projects, quoting freely from project proposal and project reports. The section on the proposed project describes the project as it was originally conceived; the implemented project section details all deviations from the original plan; the obstacles section describes procedural difficulties that future project directors may find instructive; the section on project personnel attempts to delineate any distinguishing characteristics of the project personnel, role models or consultants; the section on primary outcomes reports and compares the results given in the project documents, the participant impact survey, and the site visit observations. Sections on secondary outcomes, materials and dissemination, project costs, and conclusions and recommendations are also given for each project. Chapters III and IV, Interim Recommendations and Alternative Interventions, follow the description of the projects.

CHAPTER II
PROJECT SUMMARIES

A. "Increasing Participation of Qualified Women in Traditionally Male Science Careers"
University of Kansas, Lawrence, Kansas 66045
Project Director: Walter S. Smith, Associate Dean of Women
Project Amount: $12,745
Educational Level: Secondary

1. Proposed Project*

The project was proposed to test the hypothesis that if college freshman women who possess the necessary ability, become aware of the barriers and receive parental and peer support in their effort to overcome the barriers, then these women (the experimental group) will enter traditionally male science careers in a significantly larger proportion than a comparison (control) group which does not receive special treatment.

The subjects for this project were to be drawn from women seeking admission to the University of Kansas who possessed high science and mathematics ability, have taken high school science and mathematics courses adequate to pursue a college science major, but do not aspire to a traditionally male science career (defined as one in which males constitute more than 80 percent of the practitioners). Two groups were to be identified: the first, seeking admission in Fall 1974 (the comparison group) and the second, seeking admission in Fall 1975 (the experimental group). Each group was to have 100-150 members.

Members of the experimental group and their parents would be invited to separate, concurrent workshops in the Spring of 1975. The comparison group would not have access to the workshops in the Spring of 1975, or to any other aspects of the instructional treatments. Both groups were to receive the same post-tests, although the comparison group would receive the post-tests one year earlier than the experimental group.

The purpose of the student workshop was (1) to identify for each student aspects of her own self concept which may inhibit her choice of traditionally male science career, (2) to work in group life planning sessions to understand ways in which these inhibitions have affected her career choice and to broaden the range of possible

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*Taken from "Brief Descriptions of 28 Studies and Experimental Projects Related to Careers in Science for Women Funded by the National Science Foundation for Fiscal Years 1974 and 1975." National Science Foundation. August 1975.

career choices for each participant, and (3) to show the students how they can use the University's resources to pursue a traditionally male science career. At the same time, but in a separate workshop, the parents would be introduced to possible realistic career and life patterns for women and be given an opportunity to explore new career aspirations for their daughters.

Following the workshop, the student participants were to continue a home course of study which would build on the workshop's objectives. This course of study, to be completed before the start of their first semester in college, would yield college credit.

The participants were to be encouraged to live in the same residence hall during their first year in college, so that they would be able easily to meet formally and informally to discuss problems, provide mutual support, and continue to make plans to overcome personal and external barriers to their pursuit of traditionally male science careers.

The two groups were to be compared at the start and end of their freshman years. Comparisons would be made in (1) career choice, (2) awareness of barriers which have impeded women's entry into traditionally male professions, and (3) success in personally removing barriers from entry into traditionally male science careers (e.g., expectation of personal career achievement, independence of spouse, and willingness to assume responsibility). Using the same testing procedures, the two groups will again be compared five and ten years after the start of their freshman year.

An additional result of this project was expected to be the development of an exportable package of instruction which could be used by other universities or by the high schools to increase the science career aspirations of their women students.

2. Implemented Project

The workshops went as planned, each with 12-19 participants. Five, rather than six, workshops were held because of an insufficient response in Kansas City. The emphasis on barriers was dropped in the workshops because pilot studies had demonstrated that it was a negative approach, sometimes creating anger and discouragement among the participating women.

The home study course, Women in Professional Careers, was offered by the University of Kansas for three hours of credit. Although some interest was indicated in this course at the workshop, only six of the women actually completed it.

Further, the intention for the experimental students to live together during their freshman year did not work out because of other variables, such as the necessity of living in scholarship halls, etc. Bi-weekly "rap" sessions were to replace the group housing arrangements. As of November 1975, however, very few of these sessions had taken place, and the attendance had been poor.

For all practical purposes then, the majority of the experimental group participated only in the single day workshop, with half of their parents attending a shorter workshop.

Recruitment and sampling. The selected sample was composed of women who (1) scored 27 or higher on the ACT mathematics and the natural sciences tests; (2) had completed three years of mathematics and two years of science in high school and (3) had applied to the University of Kansas for admission. All persons in both the experimental and comparison groups met these criteria. The criterion of not aspiring to a nontraditional science career was dropped so that women already choosing traditionally male science careers could receive additional support and could serve as role models for other women. The percentage of response (test completion) of the identified freshmen in the class entering in 1974 meeting the criteria was 77 percent or 110 women. Less than the expected number participated in the workshop. Of the 256 identified in the pool, 78 (28.5 percent) actually participated in the workshop. Almost 50 percent of the parents attended.

At the time the women were invited to the workshops, letters were sent to each of their schools explaining the workshop. The schools were invited to send names of qualified women. A total of 81 names was sent to the project personnel in response. Separate letters were sent to their parents. All letters contained a descriptive brochure with the invitation. Sixty of the workshop participants had been included in the original mailing and 13 had been named by the counselors.

3. Obstacles to Implementation

No severe problems in scheduling or workshop implementation were encountered other than attendance. Reasons accounting for the lack of participation in the workshops were speculated to be: (1) conflict with other activities, (2) travel distance to the workshop, (3) even though the "science" aspect was not emphasized in the invitation, many women had no interest in a science-related career, (4) some women perceived the workshop to be linked to attendance at the University of Kansas, (5) some women may not have been interested in career exploration because it was held late in the senior year (April and May), and (6) some women may have perceived the workshops as "women's libber" activities.

The problems in getting the young women to complete the home course of study were apparently due to other summer commitments. The evaluation team does not have any additional incentives to suggest in addition to college credit that could be employed prior to college entrance to facilitate participation in the course. However, the course could either be used as an on-campus course, and/or as the basis for the "peer support" group.

The aim in housing the young women together was perhaps unrealistic given the character of the campus and the diverse constraints, interests and friendships of the young women. The poor attendance at the "support sessions" would appear to be an ongoing problem; the women reported that there always seemed to be work pressure and exams. Participation in the rap/seminar sessions, however, might have been increased by an earlier start in the semester, and by a more concentrated effort in planning by the project staff.

4. Project Personnel

The evaluation team was impressed by the depth of resources available to the project personnel. The project personnel who were interviewed were competent and had an unusually mature commitment to career/life options for women. The project director, a male, is vitally concerned about women's issues. Both by his views and his lifestyle, he was a positive influence on the program and should be a good role model for young males, as well as encouraging females in alternative lifestyles.

During the site visit, some of the role models were also interviewed and positively impressed the evaluation team. Judging from the participants' enthusiastic response, they were also very persuasive speakers. The project also appeared to have had (and has) a high degree of support from the institution; especially the office of the Dean of Women. For example, the Dean's Office is absorbing the cost of continued updating of career plans of the comparison and experimental group women.

5. Primary Outcomes

a. Experimental outcomes (internal evaluation).

1. Although there was a slight, nonsignificant decline in science career choices between the high school senior year and the end of the first year in college, approximately one quarter of the comparison (control) group women chose traditionally male science careers.

2. At the end of their first year of college, the comparison group women who chose nonscience careers were less certain of their career choices than were the women who chose traditionally male or not traditionally male science careers.

3. Women in the comparison group who had chosen traditionally male science careers in their high school senior year were more likely to switch away from these kinds of careers in college than were other women likely to switch into traditionally male science careers.

4. When the comparison group women listed barriers which women face in pursuing professional careers, they most often listed lack of educational or employment opportunities. However, when presented a list of barriers, the comparison group women most often asserted role conflict (between pursuing a professional career and the role of wife and/or mother) to be a barrier preventing women from pursuing professional careers.

5. Comparison group women most often asserted that role conflict (career versus wife and/or mother) had affected their career choice. However, women choosing traditionally male science careers significantly less often asserted that role conflict had affected their career choice, as compared to those women who had selected not traditionally male science careers or nonscience careers.

This summary taken from the final report deals only with the comparison group data, separated by a year from the experimental group. Data on the experimental group and the second comparison group (those women invited to the workshop but who did not attend, but who subsequently attended the University of Kansas [n=32]) are still being collected. The data* show a much higher percentage of the experimental group pursuing traditionally male careers at the end of the first semester of college, although no differences were seen during high school in any of the three groups. As measured after the end of the first semester, 26.5 percent of the comparison group listed their first career choice as a traditionally male science career (a decline since high school) while 48.6 percent of the experimental group were planning a science career (an increase since high school). However, the second comparison group, women invited to the workshop but who did not attend, also showed about the same percentage (50.0 percent). There are several alternative hypotheses for this increase in choosing science-related careers in the 1975 experimental

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*Walter S. Smith, "Science Education in the Affective Domain: The Effect of a Self Awareness Treatment on Career Choice of Talented High School Women." A paper given at the National Convention of the National Association for Research in Science Teaching, San Francisco, April 1976.

and comparison groups. First, it could reflect changes independent of the "treatment" or workshops. Second, it is possible that the invitation to the workshop was as effective as attendance at the workshop. Third, the group being invited may have had contact with and been influenced by the experimental group of women. Finally, and perhaps most probable, is a changing trend over years, e.g., the first comparison group entered a year prior to the experimental intervention.

b. Participant impact survey. A total of 58 participant impact survey forms were sent to participants of the University of Kansas experimental program. Thirty-nine (67 percent) of the participants returned the form.

Of the 39 participants returning the impact form 36, or 92 percent, were currently taking a math or science course. Only two of the 36 reported were taking the course as a result of the program; the remaining reported would have taken the math or science course whether they had had the program or not.

Three-fourths (74 percent) of the respondents indicated they had chosen a math or science career. Ninety-three percent of those choosing a math or science career stated that they would have done so without the program. One respondent chose a math or science career as a result of the program and one respondent was uncertain if her decision to enter a math or science career was a result of the program or not.

The responses appear to have either been biased toward those choosing a science career or a continued "switch" toward science is occurring in the participants. That is, a higher percentage reported pursuing a science career in the DRI survey than in the more recent project survey.*

The respondents were also asked to state what they felt were the most positive and less influential aspects of the program.

The most frequently cited positive aspects of the program were the use of role models, giving the participants the opportunity to meet women already successful in their careers (23 percent); support and encouragement from the program to enter their chosen career field (23 percent); information on career options open to

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*The participant impact form did not distinguish between traditionally male science careers and traditionally female science careers, e.g., nursing may have been considered a science career by some of the respondents.

women (28 percent); and peer group reinforcement in entering non-traditional careers (21 percent). Other positive comments included such statements as "the sharing that took place among the young women, and also with parents," "it helped me to know what to expect from college and there were people I met who I could talk to when I had questions," and "the fact that there was and is an organization which formally recognizes and encourages women into traditionally male careers."

The most frequently cited negative or less influential aspects of the program were that there was too much emphasis on self awareness and self searching exercises (23 percent); the program was not oriented toward the participant's needs (21 percent); the program was just not very worthwhile for the participant (15 percent); and the complaint that there was not enough specific career information. Other negative comments included "too general," "to be quite honest, I really didn't understand the whole point of the program" and "not enough activities."

c. Site visit conclusions. While on the University of Kansas campus, the evaluation team visited with about 15 participants of the workshop. All of the young women interviewed were positive about the program and several discussed the importance of having their parents attend the workshop, by explaining that they had not discussed their career plans with their parents prior to the workshop and that most of their parents had been more supportive of their nontraditional aspirations than they had expected. Most of them said they had always been committed to having a career and appeared well motivated.

The women commented on several aspects of the program. First, several suggested using the "home study" course on professional women with a peer group, e.g., classroom situation. Secondly, none felt that the (deemphasized) section on "barriers" or obstacles to be discouraging. Third, some women thought the workshop should be limited to those who had already chosen science as a career. In contradiction to the comments on the impact survey, most of these women thought the workshop material on self awareness was excellent. Therefore, the hypothesis that the women had matured in the last year enough that the "self awareness" exercises seemed trivial in retrospect must be entertained to explain the data from the DRI survey. Finally, the part of the workshop they reported enjoying most were the role models.

The two students interviewed who had taken the home study course had enjoyed it and thought it was valuable.

6. Secondary Outcomes

There are two population groups that may have been impacted; the parents and the institution.

While the evaluation team did not interview any of the parents, most of the young women whose parents had attended the workshops perceived their parents as supportive and said that the workshops had initiated fruitful interactions between the women and their parents.

The second impact area is the Emily Taylor Resource and Career Center for Women at the University of Kansas. The evaluation team was very impressed both by the resource materials of the center, the wide range of activities sponsored by the center, and the genuine dedication of its personnel to the concept of free, informed and active decisions made by women in their lives. Since some of the personnel seemed somewhat discouraged by the current attitudes of the female students, the project had both a positive psychological, as well as financial, influence on the center's personnel.

7. Materials and Dissemination

A complete curriculum for both the young women and parents workshop is included in the report along with the instructors guide. The final report also includes the "home study" course curriculum. The interim report includes a Test of Women's Awareness of Barriers to Science Careers but does not provide any reliability/validity data on the scales.*

Negotiations are currently being conducted with the National Association of Science Teachers for distribution of the entire package.

A similar program is continuing at the University of Kansas.

8. Program Cost

The total cost of the program was about $16,800, including $4,100 of the cost sharing from the University of Kansas. Therefore, the initial cost per participant was about $155 ($16,800/108 participants and parents). The cost to administer this program was claculated on an estimated $6 of printing cost per participant. About 90 percent of the project was devoted to materials preparation. Therefore, the cost of setting up the workshops could be very inexpensive, and the cost would decrease as the number of participants increased. However, most of the participants interviewed did not feel that a large increase in group size was desirable. Therefore, a rough estimate of the cost to reuse the materials would be about $10 per person.

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*Some information regarding reliability is provided in Walter S. Smith, op. cit.

9. Conclusions and Recommendations

1. Although clear cut experimental findings are not available on the experimental group, the workshops were judged to be generally effective by the participants.

2. The participants judged the "role models" to be the most effective component of the workshop. They also commented on the fact that "someone was interested in their careers" and being made aware of the fact that women can and do become scientists.

3. No conclusions can be reached about the "home study" course, although the little data available suggest that it is interesting and well prepared. The evaluation team would like to see it utilized and assessed.

4. The materials are complete and in usable form. Additional dissemination strategies should be implemented to further their utilization.

5. Most other career workshop materials may also be effective with males and younger age groups, as well as persons of all abilities and motivational levels.

6. The housing and peer support groups may be more appropriate for upper class women and might meet with better success if structured around a task, e.g., a tutorial program, a special course, etc. An alternative might be to utilize the home study course on professional women during the freshman year.

B. "Science-Oriented Career Development Workshops for High School Girls"
Policy Studies in Education, New York, New York 10017 (Grant originally made to Institute for Educational Development)
Project Director: Virginia S. Newton
Project Amount: $65,193
Educational Level: Secondary

1. Proposed Project

In this project a series of career development workshops were to be designed. The workshops were to be developed to serve as a model for use by schools as a whole package or as separate units for natural science, mathematics, or social science classes. They were to include two lifestyle workshops, three career-cluster workshops relating to three broad areas of science, and one integrating workshop. Five of these would be pilot tested in the first semester of the 1974-75 school year in one school; all would be field tested in the second semester in the first school and in a contrasting second school.

Project personnel were to include staff from Policy Studies in Education and Catalyst, a national nonprofit organization founded to expand career opportunities for college-educated women. They were to work with associates from selected schools. Female and male workshop speakers would serve as role models. An advisory committee was to function as a resource concerning specific content for the career cluster workshops.

The girls who participate would be compared with similarly selected nonparticipant groups with sixty persons in each group. They were to be at or above grade level and possessing the potential for entering scientific careers. Only women were to be included in the experimental groups, but men and women were to be contained in the control groups. Pre- and post-instruments would be used to assess initial levels and changes in the direction of the predicted student outcomes. Formative evaluation techniques, used throughout the project, were to furnish information on the reactions of the student participants, the school associates, and the workshop speakers.

The major comparisons in the data analysis were to involve participant vs. comparison groups; grade 10 vs. grade 11; noncoeducational vs. coeducational school settings; and socioeconomic/ethnic grouping. These major variables were to be examined in relation to such variables as career orientation, knowledge of scientific fields, college and career preferences, and sex-role stereotyping.

The project was expected to result in a full description of the model for use in other schools, a teacher's guide, a compendium

of resources, separate guides for the individual workshops, career guidance materials, and a videotape to illustrate the workshop process.

2. Implemented Project

The program consisted of six career development workshops scheduled for double class periods for pilot and field testing, and fairly closely followed the proposed plan. However, an additional school was added in the field testing for a total of three to increase the number in the experimental group.

Recruitment and sampling. The recruitment was done through the school system, and not by direct contact with the young women. Scheduling arrangements, assignment, and notification of eligible women was also the responsibility of the school. Original contact was made with the school principals, and responsibility was shuffled down to other personnel.

Because of scheduling and space problems due to the two consecutive period criteria in the high schools, the number of young women in the experimental and control groups were reduced: instead of 60 in each, there were 30 in the experimental group, 27 comparison girls, and 19 comparison males. Moreover, some of the students did not meet the criterion of (1) at least grade level in basic skills, (2) expect to go to college, and (3) have the basic potential for higher level scientific careers. The reduction in the sample made comparisons between sex, socioeconomic levels, and grade levels impossible.

3. Obstacles to Implementation

As mentioned above, severe problems in scheduling were created because of the constraints of the two hour period and the agreement with the schools that the young women would be released from a gym class. Although this could have occurred to some extent in single session scheduling, it was compounded by attempting to free two consecutive hours for a select group.*

In addition, because of changes within the agency receiving the grant (the grant was awarded the Institute for Educational

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*Many of the extreme problems encountered by this project may have been exacerbated by the uncertainty and budgetary constraints prevalent in all New York City schools the year the project was implemented.

Development, but transferred to Policy Studies in Education), additional administrative problems were encountered with the subcontracting arrangements.

4. Project Personnel

The project director, Dr. Virginia Newton, is a very competent woman who had worked previously in the New York City school system. Unfortunately, she had little direct contact with the students. Considering the major problems with administration of the grant, and the scheduling problems with the school systems, it is remarkable that the program was completed.

The class teachers were one male with a background in English, and two other teachers who were females with a science background. Teaching in one of the classes was assisted by Ms. Susan Ebbs, of Policy Studies.

The evaluation team met only a few of the 37 role models. Each of these seemed to vary in effectiveness, according to the subjective reports of the student participants.

5. Primary Outcomes

a. Experimental outcomes (internal evaluation). An analysis of variance was planned to determine the pre-post treatment effect by sex, socioeconomic level and age group. Since the assignment of the sample was neither random nor counterbalanced, it was decided that an analysis of variance was not an appropriate tool. Other tests of significance were also discarded as inappropriate.*

On the whole, the changes on the items were small and likely would not have reached the significance level. Looking only at the direction of the change for the one school where pre-post test results** were reported, several tentative hypotheses may be suggested:

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*A *t* test of difference scores may have been appropriate and sufficiently robust if item independence and a normal distribution were assumed. The differences would have to have been very large or the variance very small to achieve significance. Several different types of nonparametric statistics might also have been applied.

**The timing and conditions of test administration were not contained in the final report.

1. The level of educational and occupational aspirations may have increased.

2. The range of nontraditional career choices may have decreased, as well as interest in science occupations. The test was constructed so that this may have reflected only the increased knowledge of these fields.

3. The students perceptions of the female scientist increased on evaluative and activity dimensions of the semantic differential, but decreased on the potency dimension.

4. The testing instrument was not sensitive enough to measure the differences that did occur.

The final report did reach certain conclusions regarding the most effective processes. These conclusions were: (1) the role models had the greatest impact on the young women, (2) the most successful format was some kind of "ice breaker" followed by a session of prepared questions from the students (formal presentations by the role models was not felt to be satisfactory), (3) the most successful role model was young, personable, at ease with the students, and had a lot of enthusiasm for her job, irrespective of its content, (4) a circle arrangement for the workshop was the most effective, and (5) the group size should be no larger than 12.

b. Participant impact survey. Impact questionnaires were sent to 28 participants of the Policy Studies in Education program by DRI. Ten (36 percent) questionnaires were returned.

Among the ten respondents, seven (70 percent) were taking a math or science course. Six of those reported they would have taken the course without the program, while one took the course as a result of the program. Six of the ten respondents were planning a career in math or science. Only one of the six reported planning such a career as a result of the program, while the remaining five reported they would have chosen a math or science career with or without the program.

Three of the responding participants are now planning a different career as a result of the program. However, only one of the three is planning a math or science career. The remaining seven respondents had not changed their career plans as a result of the project.

The most frequently cited positive aspects of the Policy Studies in Education program were the role models--successful women

in scientific careers talking with and answering the questions of the participants (40 percent) and the career information gained from the program (40 percent). Among the other positive comments were "Learning newer and different methods," and "Proved that women can really succeed in the world if they really try and work hard."

In general, the comments were more frequently negative than in the other programs. The most frequently cited less influential aspect of the program was that it was boring (40 percent). Other comments included comments that there should have been more classes and workshops (20 percent); that there should have been more speakers (20 percent); and that the program was not oriented toward the participants' needs (20 percent). Other comments included "I didn't learn anything I didn't already know. I was brought up in a math and science oriented household," "There wasn't enough contact with men and women who have succeeded in their careers. We never visited men and women working at the same job," and "The program should be introduced to younger people; it might possibly have a greater effect on them."

These results do not appear to be congruent with the conclusions in the final report. That is, a larger percentage were now taking nonrequired math and/or science courses than indicated in their final report, and a larger percentage were planning a career in science fields. While the actual number responding may not have been representative, and was very small, the behavioral results may have been more positive.

c. Site visit conclusions. The evaluation team met with most of the young women from one of the schools representing a lower socioeconomic community, several of the role models and the project staff. The young women were quite vocal and enthusiastic about the course, although they admitted that they really didn't know what it was about when they signed up. Several mentioned that they now wanted a "career" rather than a "job." More of them were now considering college and said they were generally aware of a wider variety of occupational options. They said they had liked the small group experience and did not want to see males integrated into this kind of program. They liked the younger role models, especially college age, but thought the mixture of ages and levels of achievement was good. In general, they appeared to be much more interested in lifestyle questions than questions about occupational content. The most interesting finding was that although they had dropped math and science as soon as it was no longer required, 70 percent were now taking nonrequired math and science courses.

Close examination of the respondents of the survey showed that they were predominantly from the school where the site visit was made. Therefore, there was almost complete overlap with the

students interviewed during the site visit (generally positive) and those responding to the survey (generally negative). Therefore, either the young women have changed their minds about the program or felt some pressure to be less than honest during the site visit.

6. Secondary Outcomes

As far as could be ascertained, none of the schools is continuing this curriculum. It seems likely, however, that its existence raised the "consciousness" of some of the teachers and counselors, and a more flexible teaching style was reported for one of the teachers.

Several of the young women reported that they had discussed the program in detail with several friends and parents.

7. Materials and Dissemination

The final report contains a teachers guide, explaining the purpose of the material and suggestions for its use, either as a package or as separate units in related subject classes. The "student log" for students contains the lessons, exercises, occupational information guides, etc. The report also contains a "student survey" which includes: (1) personal data, (2) a semantic differentiation, (3) future time perspective, (4) sex role attitudes, (5) aspirations, (6) interests, (7) occupational choices, (8) level of confidence about reaching goals, (9) work values, and (10) information on science related occupations. Although sections of these were modifications of existing instruments, no reliability or validity data are reported for them. A videotape of some of the sessions is also available as an "instructors aid."

Many of the curriculum packets were printed and sent to appropriate personnel. To the project director's knowledge they have not been used.

Although the proposal indicated that the materials would be made available to ERIC or ADI, no mention of dissemination activities is included in the final report.

8. Program Cost

The total budget for the program was $65,185. Therefore, the cost per participant for the original program was approximately $1,500 ($65,185 for 45 participants). The estimated cost to reuse

is $300 for the teachers time, about $25 per role model ($300), and the cost of copying the 60 page log book (about $3.00). Therefore, DRI's estimates that, based on a class of 12, the cost per participant would be about $50.00 per student.

9. Conclusions and Recommendations

Many of these recommendations coincide with those included in the final report of the project.

1. Although the project did not serve to directly influence the number of young women considering a science-related career, most of the young women found it useful as career education and for future planning. On that basis, the evaluation team would like to see activity to implement this kind of program sponsored by the secondary school systems.

2. The role models appeared to be the most effective component in this project. An interesting comparison may be that the less able group was more interested in the lifestyle of the career women models.

3. This program may be more effective with high ability young women already expressing an interest in science careers.

4. The final report concludes that encouraging science interest should start at a younger age before interest patterns are crystallized, and this type of program might be implemented earlier.

5. It may avoid some of the scheduling problems not to attempt a consecutive two hour period, but have a regular class period.

6. A preference was expressed for all-female classes.

7. The materials package is complete and could be utilized at different high school grade levels either in its entirety or in sigments.

8. The process or administrative problems encountered by this project should be instructive to persons intending to work directly with the public school system in a sustained program. The problems are described in detail and without defensiveness in their final report.

C. "Development of Educational Materials to Recruit Women Into Scientific Careers"
Queensborough Community College, Bayside, New York 11364
Project Director: Dinah L. Moché, Department of Physics
Project Amount: $20,129
Educational Level: Secondary and College

1. Proposed Project

Multimedia packets (including slides, written materials, and an audio cassette) were to be prepared on five living women scientists, representing a range of ages and diverse field of expertise. The packets were to concentrate on explaining the research work the women are doing but would include a small addition of personal data. Each woman was to be personally interviewed by the Project Director.

For evaluation, five selected educators in different educational positions would administer a questionnaire before and immediately after the use of the packets to measure their impact on the cognitive and affective behavior of students regarding careers in physical science.

2. Implemented Project

Six rather than five women were interviewed. Cassette tape, slides, and written material were abstracted from the interviews for the package.

Recruitment and sampling. For the evaluation, two of the five educators administering the materials volunteered and the remaining three were recruited. One of those volunteering was one of the project staff of the Policy Studies career workshops. All but one of the institutions were secondary schools, and one was a large university.

The sample consisted of 206 persons; 86 were males and the remainder females. Nine females were already interested in science careers and were at the univeristy level.

3. Obstacles to Implementation

No specific difficulties in completing the package or administering the evaluation are reported.

4. Project Personnel and Consultants

The six women incorporated in the multimedia package come from a variety of backgrounds: they represent astronomy, biophysics, engineering, nuclear physics, science and society and space-life science. All but one of the women have doctorate degrees. The women represent white, black and oriental ethnic backgrounds and a variety of lifestyles.

The collection represents some of the top women in science today, each of whom have shown great accomplishments. The media package presents the extraordinary woman who has succeeded, and likely instills pride in being female. None of the women, however, would be easy for a young high school woman to identify with.

5. Primary Outcomes

a. Experimental outcomes (internal evaluation). The final report shows no significant difference between either the pre- and post-test data or the control and experimental groups. It is unclear from the report who the control group was.

The evaluation team attempted to obtain the raw data. The original comparisons grouped all students together irrespective of age, high school or sex. It was felt that a different grouping of the sample might show stronger trends. Further, it was felt that a statistic other than a *t* test for means might be more appropriate (e.g., a nonparametric statistic, difference scores). Unfortunately, the data were not available, and the final report did not contain extensive information on the internal evaluation

b. Participant impact survey. No impact survey was sent to the participants because the project director did not have the names of the students.

c. Site visit conclusions. Because of the self-contained nature of the package, it was felt that a site visit would not produce additional information.

6. Secondary Outcomes

The evaluation team has no direct knowledge of secondary impacts. However, the package was used as part of another NSF-sponsored project (Policy Studies in Education). It is possible that the package influenced some of the educators administering the film.

7. Materials and Dissemination

The instrument developed as an evaluation tool is the Moché Student Opinion Questionnaire. The final report states that "Both test-retest and even odd reliability coefficients were generated. Both concurrent and predictive validity were generated." (p.4) However, none of these data are reported. While the questionnaire has the advantage of being short, the correct (desired) response to some of the items is not immediately apparent (e.g., "Universities generally offer the same proportion of science scholarships to males and females" and "Science can be just as financially rewarding for women as it is for men").

The multimedia package contains three cassettes, a written interview from each of the women, and from four to six slides on each woman. The written materials portray very bright women, some of their life experiences and some about the work they do. The tapes are of average quality* but the slides are very clear.

Negotiations are currently underway with the National Science Teachers Association and the American Association of Physics Teachers for the copyright (held by the Research Foundation of CUNY).

Descriptions of the material have been published in the Announcer (December 1974) and Science News (March 15, 1975), and a paper was given at American Physics Association in January 1975.

8. Program Cost

Twenty packets were produced under the grant. Judging from the proposal budget, more than half of the original cost was for labor and travel, with the remainder for equipment. The exact price of distribution for the packet has not been determined. It seems likely that the cost will be approximately $20 to $30. Based on a one time only showing in an average classroom, the cost per student for reuse would be about $1.00.

9. Conclusions and Recommendations

1. The project exceeded its contractual agreements (six interviews rather than five) in the allotted time period. The packet is transportable, convenient, inexpensive and

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*The evaluation team played the cassettes on good audio equipment and still had some difficulty understanding all of the interviews.

of good technical quality (although the cassette requires a good quality deck for reproduction).

2. The effectiveness of the package in changing attitudes cannot be assessed from the design of the internal evaluation and the data analysis.

3. The packet would appear to be easily combined with any other program, and applicable to a wide range of age groups from junior high to reentry groups.

4. Dissemination activities have been conscientiously conducted, although the current status of the copyright is not known by the evaluation team.

D. "Preparation of Ancillary Materials for, and Formative Evaluation of, a Film on Women in Engineering"
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
Project Director: John T. Fitch, Center for Advanced Engineering Study
Project Amount: $35,919
Educational Level: Secondary and College

1. Proposed Project

The Center for Advanced Engineering Study at MIT has completed the first version of a film ("Women in Engineering"), which is designed to motivate young women in high school and the early years of college to consider careers in engineering. Produced in cinema verite style, it presents engineering students and professional women engineers in school, at work, and at home. Showing these women in discussion groups, in the classroom, and on the job, it was hoped, would provide an understanding of engineering, dispel some of the myths and stereotypes surrounding engineering, and provide female role models. NSF funds were to be used for the preparation of guides for students and educators, for a formative evaluation of the effectiveness of the film and the ancillary materials, and for modifications of the materials based on the findings of the evaluation.

An important component of the work was to be a two-stage evaluation of the proposed materials. Two major purposes of the evaluation work were to be: (1) to provide feedback to the filmmakers and writers that will facilitate and strengthen the development of the proposed materials; and (2) to document the effectiveness of the materials when used in a variety of settings.

A number of questions have been posed to serve as a framework for the evaluation study:

1. To what extent does participation in the proposed project broaden students' understanding of the field of engineering--in terms of its function in society and the range of career opportunities?

2. What impact does the film, the ancillary materials, and related classroom discussions have on students' attitudes and concerns both toward engineering as a career and toward the role of professional women engineers, in particular?

3. Do students develop a clearer understanding of the the skills and interests needed to enter the field?

4. Are students better able to analyze their own abilities and interests in relation to pursuing a career in engineering as a result of having participated in this program? Do they demonstrate a clearer understanding of how they might pursue their interests in this field?

To address these questions, MIT planned to employ several complementary clinical and survey techniques to gather relevant data. Interviews with students and teachers were to be conducted using a semi-structured format and open-ended questions. Classroom observations were also planned. Data collected by these methods were to be used to illuminate quantitative findings gathered by means of written questionnaires. The questionnaires were to be primarily multiple (forced) choice in format, although they would also include a number of open-ended questions. In the first stage, trial versions of the film, student leaflet and educator's handbook would be tested locally in a small sample of classrooms (approximately five). During this period the evaluation instruments were to be developed and pre-tested. A questionnaire was to be administered to students in each of the classrooms; several students in each classroom and their teachers were to be interviewed; and classroom observations would be made during the viewing and discussion periods.

2. Implemented Project

One goal was added to the evaluation goals. The added goal was "what are teachers' and students' evaluation of the materials in terms of its strengths and weaknesses?" (p. 3 final report).

Although the exact sample to be used in the evaluation was not specified in the proposal, the experimental sample was comprised of 106 students from seven schools; 16 percent of these were male and 84 percent were female. About 20 percent were minority persons. They were in either tenth, eleventh or twelfth grades (3.5 percent, 13.2 percent and 62.3 percent respectively). Seven teachers were also included. The comparison group contained 109 students from different schools of approximately the same socioeconomic mix; 12 percent of the sample were male and 88 percent were female.

Both groups received the evaluation instrument a single time, e.g., a pre-post film exposure comparison was not considered appropriate for a short time period.

The evaluation instrument was an opinion questionnaire designed to assess the students interest in engineering, their understanding of the field requirements, their images of male and female engineers, reactions to women combining career/family roles, and their evaluation of the materials. In addition, semistructured interviews were given

to the entire sample of teachers on an individual basis and a subsample of students in small groups. The interviews were designed to obtain in-depth opinions about the information presented in the film and booklet, as well as the material itself.

Recruitment and sampling. The final report on the evaluation indicates that several schools in the area declined to participate for reasons of conflicts in scheduling, reservations about the "controversial" nature of the subject, and the single sex orientation of the film. Nonetheless, the project personnel were able to obtain an adequate number of subjects across grade level who were predominantly college bound. The "recruitment" was done by working with school administrators and teachers rather than contacting the students individually.

3. Obstacles

No obstacles to conducting the evaluation have been reported other than those relating to obtaining the agreement of the schools to participate.

4. Project Personnel and Consultants

Since the "Project" is a media product, the attitudes and personalities of the project personnel are only important as conveyed in the material. A more relevant area of concern is the personalities of the people portrayed in the film and booklet. The film has been requested and not yet received. Therefore no judgments about its role models can be made. In the booklet, Choosing a Career Woman's Work: Engineering, interviews with three of the persons portrayed are given. One is currently at MIT as a student, one a middle-aged woman, and one a younger woman. The three have different lifestyles (one single, one a single/parent, one a married/parent), three different stages of professional development, and three different types of engineering. The role models come across as very positive about their lives in the booklet.

5. Primary Outcomes

a. Experimental outcomes (internal evaluation). The final report contains a complete description of the formative and impact evaluations and procedures.

One of the primary outcomes was that after seeing the film, significantly more students were now undecided about engineering as a career (27.4 percent vs. 10.4 percent) and a significantly larger percentage (51.9 percent vs. 28.3 percent) said that they were not

interested in the field. It should be noted that students answered the questions about how they felt prior to seeing the film at the same time they answered the questions about how they felt after seeing the film. The film apparently confirmed questions concerning the unsuitability of engineering for them, but made it an interesting consideration for others. Interestingly, a larger percentage (6.6 vs. 1.9 percent) reported not "thinking about" a career after seeing the film. The percentage reporting that they had decided to become an engineer was identical both before and after the film (.9 percent).

The report states that the most intensive discussions among students and teachers "related to this dual role and questions of how to and whether to juggle a career--any career--with a family and home life" (p. 12). Young women appear to be more interested in how careers can fit into their lives, rather than the content of any particular occupational area. Interestingly, although 81 percent thought engineering was appropriate for a woman, only 55 percent thought combining a family and a career was a good idea for a woman.

Another outcome was that significantly more twelfth graders checked that the film was not related to their interest. This was interpreted to mean that most seniors had already decided what they would be doing for the next few years. The report concluded, then, that the film was more appropriate for earlier secondary years.

The outcomes of the comparison between the control and the experimental group were:

1. Significantly more of the comparison group were definitely not interested in engineering and more in the experimental group were undecided.

2. Significantly fewer of the students in the experimental group checked that male engineers worked with heavy machinery, while more of the experimental group checked that male and female engineers were creative.

3. There were no significant differences in students feelings as to whether engineering was appropriate for women as a career, but more students in the experimental group felt that the problems they encountered might be solved.

4. In open-ended questions the students in the experimental group listed engineers as needing creativity, problem solving skills, and sciences, while the comparison group listed working with machines (or their hands) and general intelligence, and the experimental group appeared to be more accurate in listing the necessary preparatory courses to be an engineer.

The formative evaluation and interviews suggested several other things. First, the report states that there was considerable interest in the lifestyle of the career woman. However, the most interesting part of the film was the content of the engineer's job and the most frequent criticism was a desire for more factual information about what engineers do. Suggestions also included shortening the student booklet.

b. Participant impact survey. Because of problems due to privacy considerations, the project personnel do not have the names of many of the project participants. The participant impact survey will be sent directly to the schools with a request that they distribute the form. The results will be included in the fall report.

c. Site visit conclusions. Because the project was a media product, not significantly influenced by personalities of the project staff, no site visit was made. Although the evaluation team recognizes that the personalities of the persons leading the discussions (teachers) may influence the pursuant attitudes, it was felt that this influence could not be adequately assessed under the conditions of the evaluation.

6. Secondary Outcomes

No secondary impacts are reported. It is possible that the existence of the project impacted some of the secondary school teachers as well as the MIT faculty working with it.

7. Materials and Dissemination

The final report includes a teachers guide, a booklet entitled Choosing a Career Woman's Work: Engineering and the film entitled Woman's Work: Engineering. The 25 prints of the film have been turned over to the MIT Educational Councils and is currently listed in the 1976-77 catalogue. The film has already begun drawing orders. The film was also transferred to quadraplex videotape for distribution to television. Requests for the film have been made by individual public broadcast stations and it has been reviewed by one educational television network. MIT also is negotiating with Education Development Center, Inc. which has experience in distribution to more than 60,000 school systems, to distribute the film and accompanying program materials.

8. Program Cost

The budget to the National Science Foundation states that $21,000 was spent to finish the film, about $9,500 for construction of the

auxiliary materials, $2,000 for the film prints and $3,500 for the evaluation. The cost to reuse the film is currently listed in the MIT catalogue as $245 for purchase, $25 for rental. The teachers manual (16 p.) and the student handbook (20 p.) would be $25 + $36 copying expenses or about $2 a person to reuse the film package in an average class of 35 students.

9. Conclusions and Recommendations

Several conclusions may be made from the available data.

1. The film and booklet offered some concrete information about the field of engineering, and the requirements for entry.

2. The film and booklet encourage some awareness of women in nontraditional careers, e.g., it provided a means to explore the problems and rewards of women in professional jobs.

3. The dissemination activities incorporated in this project are excellent, and may be used as a model for other projects, although it is simpler to disseminate media packages, as opposed to a more complex program.

4. Recognizing the extremely small amount of money allocated to the internal project evaluation, the evaluation team feels that development of a more standardized measurement instrument by NSF would be especially useful; e.g., although the approach of congruent validity used in this study (use different instruments conceptually related to arrive at a conclusion) provides a basis only for a more general interpretation of results. Further, although the use of the comparison group is good, the linking of "before I saw the film" and "after I saw the film" likely confounded the results. The report of the evaluation, however, is detailed and complete.

5. The evaluation team would prefer to see a greater number of males included in the evaluation of such projects, so the differences could be conclusively analyzed. Specifically, although males were included in both the experimental and control groups, no differences by sex are reported. It is assumed that either (a) no differences were present, (b) the differences were not analyzed or (c) the number of males in the sample was too small to show any reliable difference.

6. The materials are probably most appropriate for eleventh graders and tenth graders of high ability. They can be easily adapted for a single class period in any subjects related to engineering or career education. Since the impression made on males by the film were not discussed, the film might be most appropriate for career education classes, rather than science or math classes.

E. "Increasing Women in the Sciences Through an Experimental Mathematics Project"
University of Missouri, Kansas City (UMKC)
Principal Investigator: Dr. Carolyn MacDonald
Project Amount: $27,664
Educational Level: College
Project No.: GY 11326

1. Proposed Project

Thirty freshman women entering UMKC in the fall of 1974 were to be selected for participation in a project designed to increase the number of women in the sciences by reinforcing their mathematical skills. Students were to be selected for their potential ability to study successfully in the sciences. Selection would be on the basis of nationally standardized test scores. The group was to be divided into subgroups of those who expressed an interest in science and those who did not. All 30 students were to receive a specially designed mathematics course exclusively for women, with individualized and group counseling, personal assistance and tutoring, lectures, seminars, and field trips. Comparisons were to be made between the science-oriented and nonscience-oriented women on measures of achievement and satisfaction. Pre- and post-test measures of attitude were proposed. As a measure of project effectiveness the performance of the participants would be compared with students in other introductory math classes. The experimental group of 30 was to be compared with all students enrolled in Fundamentals of Math classes and also with women only along the lines of academic performance, professed interest in science, and attitudinal changes during the course of the year. As a measure of the effectiveness of the special course content and format separated from the effectiveness of the teacher, a follow-up study was proposed of students who were enrolled during 1972-73 and 1973-74 in standard sections taught by the instructor for the experimental course.

It was anticipated that the experimental project would provide information on which methods are most effective in the classroom and counseling situation and, if successful, would serve as a model for other college projects designed to encourage able young women to plan academic programs in science areas.

2. Implemented Project

The project was conducted as planned except for the qualifications and characteristics of the subject group, for which certain proposed measures were not recorded or analyzed. Lost in the design was the dichotomization of science-oriented and nonscience-oriented attributes, on which both achievement and satisfaction measures were

to be reported. With 52 percent of the subjects reporting an interest in a science major (8 percent physical science, 44 percent biological sciences) on an initial classroom questionnaire, there appeared to be every opportunity to capture these data. Other discrepancies centered on the inclusion of several women students who did not demonstrate potential ability in the sciences. There were compelling circumstantial reasons for allowing these exceptions and in each case the exceptions biased findings against the experimental hypothesis, increasing the significance of the results.

a. Identification of participants. Thirty-two women students were enrolled in the first semester of the course. These were identified in the following manner. During the summer, the project director and a student assistant reviewed the applications, high school transcripts, and test scores of all women admitted as freshmen for fall, 1974. Possible participants were selected from those students who seemed to have potential ability for study in science, but who generally did not have strong mathematics backgrounds. The program was presented to them individually by the student assistant during the academic advising session of the freshmen orientation program. Each was given a brief written description of the program. All but one of the students whose schedules premitted enrollment elected to participate. Approximately 60 percent of the participants were selected in this manner. Twenty percent of the students were identified by academic advisors as advanced standing students who would benefit from special attention and assistance in mathematics. The remaining 20 percent were students who registered for the course due to an error at registration. Because their needs and problems were in many ways similar to the specially identified students, they were allowed to remain in the course.

The class composition for the first semester was therefore rather heterogeneous. The largest group, slightly over one-half of the students, were freshmen entering UMKC directly from high school. The remainder were divided among the sophomore, junior, and senior classes, and included transfer students as well as women who had returned to school after an absence of from one to 20 years. Ages ranged from 17 to 39 years, with about half of the students being 19 or under and one-fifth being over 30. Approximately half of the students expressed an interest in a science major.

b. The course. The course was specially developed for the project, but was offered as an experimental section of the existing introductory two-semester mathematics course, Fundamentals of Mathematics 110-120. The first semester is the equivalent of college algebra and the second semester is the equivalent of trigonometry and analytic geometry. The course content of the experimental and regular classes are similar, but with different emphases. The experimental course emphasizes basic skills and applications, while the regular course emphasizes theory and structure.

Several important differences between the first semester of the experimental section and the other sections are summarized below.

1. There were different instructors.

2. The experimental section consisted of 32 women students. The other sections averaged about twice that size and consisted of approximately one half men.

3. The course content was similar, but with different emphases. The experimental course emphasized basic skills and applications.

4. The experimental section had a daily group tutoring session, open only to members of the class. The other sections used tutoring sessions open to all students enrolled in the various sections.

5. The experimental section had occasional counseling sessions and guest lectures, which were not available to the other sections.

6. The students in the experimental section were specially selected and were aware that they had been invited to participate in a special program whose goals were to help women students acquire basic skills in mathematics and to open their career options.

The course was team-taught by Dr. MacDonald, the project director, and Ms. Barbara Currier, a doctoral student in mathematics. Both instructors attended the daily class sessions, alternating instruction in three-week blocks. The regular class meetings were preceded by an optional one-hour group-tutoring session staffed by an undergraduate student. The instructors often helped at this tutoring session and were also available to students who needed individual assistance and encouragement. There were occasional counseling sessions and guest lectures. The class had 15-minute open book quizzes weekly and regular one-hour exams every three weeks.

There were four class periods devoted entirely to supplemental activities during the fall semester and one class period during spring. These sessions consisted of talks from visiting women who discussed subjects relating to mathematics, counseling and administrative services, and career choices. The class also visited the UMKC computer center.

c. Special environment/materials. No special facilities were required for the delivery of the experimental mathematics course. Noon hour help sessions were held in a roomy laboratory adjacent to the regular classroom. The laboratory was furnished with tables that

seat four to six students. The sessions took on both social and academic aspects with some of the students bringing their lunches and eating and visiting together as well as studying mathematics. The instructors shared an office across the hall from the tutoring room. An undergraduate mathematics major tutored daily and one or other of the instructors was available to give additional assistance. A special text was used for the experimental group that is more practical and problem-oriented than was the existing text.

3. Obstacles to Implementation

There were no major obstacles to the implementation of the plan. Some of the proposed project principals and consultants did not perform on the project, and some of the proposed measures were lost. However, nothing detrimental to the active conduct of the project was discovered.

Neither the Mathematics Department nor the UMKC institution has been especially cooperative, but neither did they impede the project. The project director was not permitted, however, to gather longitudinal (sequential) course data from student record files, information that could have been secured within privacy restruction regulations.

4. Project Personnel

The project director, Dr. Carolyn MacDonald, is an assistant professor of mathematics and physical sciences. Dr. MacDonald has a B.A. and M.A. in mathematics, an M.A. in physics, and a Ph.D. in Chemistry from Brown University. Her teaching experience at UMKC has been in both mathematics and physical science, in which she teaches an extensive survey course. She taught the existing Fundamentals of Math course for two years prior to the experimental semester. Dr. MacDonald's husband also teaches at UMKC and their two young children often visited their parents at school. Dr. MacDonald's students thus had an opportunity to see her occasionally in her family role.

Other proposed project personnel were not intimately concerned with the project. The teaching assistant position was filled by Ms. Barbara Currier (now Dr. Currier) who was completing her doctoral studies at the time. Although Dr. MacDonald had much more classroom experience, both instructors were competent to teach the experimental class from the viewpoints of both content/substance and sensitivity to the special problems of many women. The instructors complemented each other well. Ms. Currier is young, newly married, somewhat more reserved than Dr. MacDonald but equally attractive personally.

5. Primary Outcomes

a. Experimental outcomes.

Math Grades—Math grades were significantly higher for women in the experimental class than for either women or men in the control (standard) classes. However, the distribution of grades was interesting: 53 percent of the women in the experimental group received A, as did 25 percent of the nonparticipants (28 percent women, 21 percent men). However, slightly more women in the experimental group received D's.

	Exp. Women N=32	Control (Women) N=342	Control (Men) N=345	Total N=687
A	53.1	28.4	20.9	24.6
B	25.0	19.0	15.7	17.3
C	6.3	12.0	17.1	14.6
D	9.4	8.5	6.1	7.3
F	3.1	7.0	9.0	8.0
W	3.1	22.2	26.7	24.5
I		1.5	3.8	2.6

Percent Distribution of Grades

It is also interesting to note that university wide slightly more women than men (375 to 345) signed up for the math class, the women's grades in general were slightly higher than the men's and there were fewer women withdrawals.

Complicating the analysis is the lack of background data on participants and control groups relating to their high school GPA's and standardized test scores. Over 50 percent of the women participants anticipated careers in science, whereas only 34 percent of the nonparticipants intended to major in science-related areas. Additionally, the experiment included the simultaneous manipulation of several variables including all female classes, smaller classes, team teaching and content changes so that it is difficult to select which of these contributed most to the apparent success of the project. Further, different tests were used to assess student grades. This problem was somewhat ameliorated by the project director's recent and current experience with students in standard math selections. Spring quarter grade comparisons also show stronger grades for the experimental class as well as higher grades in general for females.

Subsequent Courses—Compared with 1972 and 1973 control group data, significantly more participant women chose a subsequent math course than did others. Even more impressive are the figures when comparing women control group members. Unfortunately the 1974 data were not available for this comparison with a more recent student cohort.

Exp. (Fall 1974)	Fall 1973			Fall 1973		
	Women	Men	Total	Women	Men	Total
37.5	12.1	33.3	24.4	2.6	24.0	10.9

Attitudes--Questionnaires relating to student attitude and background were distributed during the first month of the class. During the last week of the fall semester a second questionnaire asking for attitudes and assessments of the course was distributed. No attempt was made to relate individual before-after responses or to relate baseline attributes to either attitudes or achievement. Students in the control groups also completed the questionnaires. In the experimental section, only one-fifth as many students reported spending only zero to three hours of study outside of class, while four times as many students reported spending 12 hours or more. Almost twice as many students in the experimental section expected their course grade to be much better than most of their previous math grades and reported that their understanding of mathematics was much better and their interest in mathematics was much higher than before they enrolled in Math 110. Three times as many students in the experimental section said that they would recommend that friends take Math 110. Almost half again as many students plan to continue with a second semester of mathematics. In the experimental section 72.0 percent in contrast with only 8.5 percent of the other students felt that the textbook was much better than most textbooks. Although almost all students were generally well-satisfied with their instructors, the ratings were higher in the experimental group, with 84.0 percent giving the instructor an overall rating of excellent and 12.0 percent good, while in the regular sections the composite ratings of all the other instructors were 47.7 percent excellent and 40.1 percent good. No questionnaires were administered during the second semester of the project.

Career Plans (College Major)--The experiment did not provide for collecting relative information on career choices of participants and nonparticipants. On an informal basis the project director had information and reported on three special cases of students either electing scientific careers as a result of their exposure or opting for a more aspiring position within a profession.

b. Participant impact survey. A total of 37 impact questionnaires were sent to participants of the University of Missouri's experimental program. Eighteen (49 percent) were returned completed.

Of the 18 participants returning the impact questionnaire, 13 (72 percent) were taking a math or science course; two participants (11 percent) were taking the course as a result of the program, while the other 11 participants (61 percent) indicated they would have taken the course whether they had participated in the program or not.

Eleven of the 18 respondents (61 percent) indicated they had chosen a career in math or science. Four of these 11 respondents (36 percent) stating they had chosen a math or science career indicated their career choice was a result of the program; while the remaining seven would have chosen such a career with or without their experience in the experimental program.

Of the 18 respondents, 14 (73 percent) experienced no change in career plans as a result of the program, however, four (22 percent) of the participants changed their career plans in favor of math or science as a result of the project.

The positive aspects of the program according to the participants were the small class size, individual attention and personal atmosphere (39 percent); a new understanding and confidence in her abilities in math (39 percent); the instruction and textbooks (39 percent); and the information, encouragement and support in nontraditional career fields (33 percent). Among the less frequent comments were "I did not feel I had to compete with males," "First and foremost --Dr. MacDonald and her 'can do' attitude," and "The best and most unique course I ever had."

Responses on the less influential aspects of the program included comments that it was not a realistic situation with only females in the class (17 percent); the program did not have a good text (11 percent); the class should have been more similar in their math backgrounds--course moved too fast or too slow (11 percent); and the most frequently cited was "none" (33 percent). Among other comments were "A lot of work and class everyday, but it was worth the time and effort," and "As a history major I resented having to take math. I just took the GRE and could do little of the math section which proved what I thought--I got a 'B' in this math class, but did not learn anything that I retained--or that will be of use to me in my career."

c. Site visit. The University of Missouri at Kansas City is the site of a private university that had been unsuccessful and was recently taken over by the University of Missouri in order to serve the high population of students seeking state supported higher education in the urban area. The school is predominantly attended by local city students and is attempting to hold to high academic standards in an area where many students from the local school system are not especially well prepared for university study. For example, Missouri does not require any high school mathematics as a prerequisite for graduation. The UMKC does not therefore require mathematics prerequisites for entry but it is not possible to graduate from UMKC without either a foreign language (in which many of their students have no interest) or college level mathematics. The mathematics department does not seem especially interested however in offering the remedial math courses necessary for students to qualify for college level mathematics study. This is apparently a transition period for the University during which time it has to come to terms

with faculty needs to teach advanced classes and student needs to compensate for their pre-college deficiencies.

At the time of the site visit in fall of 1975, both semesters of the experimental mathematics section had been completed, and the final report for the project was in preparation. We were fortunate, therefore, to be able to meet with the project director, her teaching assistant (who had a principal role in implementing project goals) and one of the two undergraduate mathematics students who tutored the participants. The evaluators also met and interviewed ten of the women who had been in one or both semesters of the course. Meetings were held in the laboratory room where students came for the tutoring sessions and in Dr. MacDonald's office. The meetings were with single students and with two or three at a time. Dr. MacDonald and Ms. Currier were present only for the introductions.

The women (who came to the session) were uniformly positive about the program and about the instructors, some almost to an extreme. Women who had been out of school for a while were the most enthusiastic about the program. When the evaluation team tried to probe the reasons for their positive attitudes in order to discriminate between the goals of self-confidence and improved mathematical learning, it became clear that in spite of the moral support, encouragement, and pleasant social aspects of the informal supportive all-female classes, students felt that the most direct benefits were increased learning in mathematics with about equal emphasis on concepts and skills. They seemed to feel that the supportive nature of the class was a mechanism for them to acquire those concepts and skills, but their satisfaction appeared to be with their performance in an area in which they had had little or no success in the past.

The evaluators met and spoke with the head of the Mathematics Department to determine the impact of the NSF-funded project on the institution. Reactions of the department chairman toward the accomplishments of the experimental sections varied from apathetic to hostile, although on repeated questioning he admitted that the text used in the class will become standard and that "apparently" the participants did quite well and more went on into calculus than would have been expected to without the program. Even though participants covered more material than did the standard sections, the department viewed the class as "remedial" and when questioned as to the likelihood of any institutional continuation, responded negatively. The evaluators asked why the department head had signed off on the proposal with such a negative attitude toward the project. No direct answer was made but it was implied that he really did not expect the project to be funded.

6. Secondary Outcomes

As reported above, no institutional impacts from project accomplishments are anticipated at the department level, at least in the short term. A request from the project director to apply for outside funds to teach a special class for older students was denied. It is possible, however, for delayed impacts to occur as the institution gets more pressure to become responsive to student needs.

The ten students interviewed were questioned as to parent-peer-sibling attitudes toward women in mathematics and women in science. The only impacts reported were from the four women in the group who were mothers of children old enough to comprehend the situation. They reported that their experience was somewhat inspirational to their daughters and educational for their sons. One woman spoke of helping her "chauvinist" teenage son with his trigonometry homework as one of the rewards of the project.

7. Materials and Dissemination

A standard text was used in both courses. The text, however, was new to the institution and is likely to be used in all sections.

The project was discussed at several mathematics meetings. Ms. Currier spoke at the annual meeting of the Missouri Section of the Mathematical Association of America. Dr. MacDonald appeared on a panel at the Association for Women in Mathematics national meeting and spoke at the Tulsa meeting of the National Council of Teachers of Mathematics. During the winter she discussed the project at a symposium on Women and Mathematics at the national meeting of the American Association for the Advancement of Science.

There were several newspaper articles written about the course and Dr. MacDonald in the UMKC newspaper and the Kansas City newspaper. Dr. MacDonald was the guest on a local television show and radio show, where she discussed women and mathematics and employment patterns of women. She also was guest lecturer at a workshop at the University of Southern Mississippi and appeared there as a guest on a television show.

Ms. Currier is now a mathematics instructor at Rockhurst College. Her involvement in the project was considered as a strong positive factor in their selection of her over other candidates.

8. Project Cost

The project was funded for $27,664. Funds were to cover instructors, tutors, supplemental materials, travel, and honoraria

for guest lectures. With a total of 54 students (32 students fall semester, 22 students spring semester) the cost per participant was $512.30. This figure includes administrative expenses, and cost of preparation, as well as implementation costs. Deducting the $8,830 budget item for indirect costs, the cost per participant calculates to $348.78. The estimated cost to replicate at the same institution on a nonoverheaded basis would be approximately $250 per participant. This figure does not include questionnaire and achievement score analysis. The cost to modify, replicate, and analyze at another institution would probably be close to the $350 per participant cost computed for UMKC.

9. Conclusions and Recommendations

1. There were several factors that were simultaneously manipulated with the experimental group that complicate the analysis of the contribution of any one of these factors. The course was team taught to all women, used a special text, provided tutoring sessions, had a smaller enrollment, and finally different examinations (content and format) than the control groups. The only valid measure to report is the percentage of women who elected additional math classes and went on into calculus. Unfortunately comparative information is not complete on this measure and the institution would not release grades in calculus.

   From informal mechanisms it can be reported that the percentage of women choosing subsequent math courses was higher than the control group, and compared to previous years was significantly higher than either men or women in standard sections.

2. The success of the class can be reported in terms of the attitudes of participants towards themselves and towards mathematics and science. A total of 61 percent of the postcard respondents indicated they were still planning on a career in science (approximately one-half the class had started with that goal). Considering normal science attrition rates, that percentage is impressive. Seventy-two percent of the respondents translated career goals into behavioral measures (additional classes). However, no baseline data for comparing control and experimental group on aptitudes and skills as measured by grade point averages or standardized tests were reported.

   The comparison of the impact of the course on science-oriented and nonscience-oriented women went unreported, and aggregate reports on percentages did not permit the examination of this phenomenon.

The general enthusiasm and acceptance of participants, tutors, and instructors indicates that the program had positive impact on them personally.

3. High on the list of attributes favored by the participants was the all-female environment (particularly for the older woman) and the supportive nature of the environment as permitted by the small pupil to teacher ratio. The project can be rated as successful in spite of the paucity of valid statistical data.

   It is difficult to sort out the most effective elements. Obviously some of the factors that contributed to participant satisfaction cannot be used routinely in math classes. It would be impractical to have all classes of men or women students only and few schools can afford to cut normal class size in half and at the same time assign two instructors and a tutor to each class. However, the supportive, can-do, atmosphere can be replicated on an extensive basis at no cost to the institutions. Until that time the lower teacher to student ratio and the special emphasis on helping women to reach their own levels of competence through elective all-female classes appears to be a helpful situation.

F. "New Opportunities for Women Chemists: Recovering Lost Skills"
Rosemont College, Rosemont, Pennsylvania
Project Director: Suzanne P. Varimbi
Project Amount: $34,043 (2 years)
Educational Level: Post-Baccalaureate

1. Proposed Project

The purpose of the proposed project was to (a) identify, locate, and invite the participation of women college graduates of the years between 1959 and 1968 whose major subject was chemistry but who had not worked as chemists since their graduation and would consider full-time employment if their knowledge and skills could be brought up to date; (b) offer a year of intensive contemporary laboratory work, supplemented by adequate review and updating in chemical principles in a lecture and seminar setting; (c) provide a working internship in an individual laboratory; and (d) offer career guidance and placement with suitable employers upon successful completion of the training.

The project was to be evaluated in terms of (a) the participant's satisfaction with the training program, (b) the success of the program in placing participants with chemical industries, and (c) the satisfaction of employers with the participant's training as demonstrated by her performance after a period of employment. The project was funded by NSF for $34,043 with approximately $11,000 additional of matching funds, $7,400 of which came from industry in the form of consultant services and visiting lecturers.

2. Implemented Project

The program was carried out as originally proposed, and consisted of self-paced review of basic concepts plus one unit course at the advanced undergraduate level plus a weekly seminar. The seminar included lectures by industrial personnel and discussions with Rosemont faculty concerning the review of basic concepts. Some general information regarding job opportunities and employer expectations was provided in the seminar. These were followed by special lectures on substantive work-related activities by the industrial speakers plus two site visits to nearby industrial laboratories. Participants were recruited via news releases, paid advertisements in local newspapers, posters that were displayed in nearby shopping centers and by spot radio announcements. Tuition costs were borne by the students. It had been anticipated that some of the area companies would offer financial assistance in the form of scholarships to the students, but the companies elected to make their assistance available in other forms, e.g., consultants, internships. The other deviation was a procedural change. The six-week paid internship

program scheduled to begin mid-year was rescheduled for the summer months at the request of the participants who felt (1) it would be more convenient for them at that time and (2) they would feel better prepared after a full year in the program.

3. Obstacles to Implementation

The only problems facing the project director regarding implementation of the program was the difficulty encountered in recruiting the women already identified to be likely candidates for the program. Of the 50 women identified (in terms of their education and articulated interest) only eight (five full-time and three part-time participants) actually began the program the first year. Project directors seemed to think tuition costs were the primary reason for the low participation rate, and began making vigorous efforts to get additional funding for tuition scholarships from foundations and from industry.

4. Project Personnel

Project personnel were as proposed. Dr. Varimbi, the project director, joined the Rosemont College faculty in 1965 and has been in charge of the advanced laboratory program in chemistry for the last three years. She is academic advisor for the junior and senior chemistry majors. She is also a young homemaker and mother and is approximately the same age as many of her returning students. The chairperson of the Chemistry Department is Sister Mary Leo Bryan (Ph.D.) who has been at Rosemont for nearly 20 years, the last six as department chairwoman. She has a history of pursuing and receiving grants for innovative chemistry teaching and appears to provide a very well-balanced mixture of humane and concerned cleric with an accomplished and savvy professional approach. Other participants were male and female faculty members who taught upper division undergraduate classes and have a history of interest in the returning student and in women students in general. The consultants were selected by the participating companies and included people with the normal variety of attitudes toward the project and toward women in science.

5. Primary Outcomes

a. Experimental outcomes. Complete data from the project are not yet available for analysis. However, the Interim Report of the project director provides a discussion of two of the three project goals: participant satisfaction and employer satisfaction.

In order to evaluate the participants' satisfaction, a questionnaire was given to each of the four women at the completion of her program. The purpose was to find out whether they felt the

program was an effective means of increasing their skills and knowledge, and also to elicit suggestions for modifying the program in the future. All the replies to date show genuine satisfaction with the opportunities provided. They also offer some practical and constructive suggestions, e.g., providing more organic chemistry review in preparation for biochemistry lectures.

The six-week, paid internship period proved to be highly successful. It is seen as an even more necessary part of the program now than at project inception. Not only does the internship acquaint the participating companies with the capabilities of the participant, but, more importantly, it provides the women with a sense of confidence they can acquire in no other way. The internship supervisors were asked to return a questionnaire. They all reported that the women were adequately trained and well motivated. As expected, there were some differences in performance, but in no case was performance reported as less than adequate. In several instances the supervisors pointed out the above-average willingness of the women to assume responsibility and ability to work independently.

An additional measure of employer satisfaction is the high retention rate of companies supporting the program. In addition to first year support, local companies which might employ chemists were sent letters describing the Rosemont program, asking them to consider the women for employment, and also inviting them to join as cooperating companies. As a result, for the coming year, three additional companies have agreed to provide seminar speakers and internships, and several others have offered to provide tours of their facilities and speakers. These new offers are all the more significant and encouraging, since at this time most companies are reluctant to commit themselves to offering more than one internship.

b. Participant impact survey. Impact questionnaires were sent to 11 participants of Rosemont's experimental program; eight (73 percent) completed questionnaires were returned.

Because of the unique nature of the Rosemont program in relation to the other experimental programs being examined, the first three questions of the impact form did not result in a great deal of useful information for the purposes of evaluation. This program was designed for women who had already earned a bachelor's degree in chemistry, thus these questions are not very relevant to Rosemont's program participants. The answers to these questions did indicate, however, that all of the program participants returning questionnaires were planning to enter or reenter careers in science and that two (25 percent) were planning different careers as a result of the program.

Seven of the eight (88 percent) responding participants cited their opportunity to update old knowledge and learning new developments

in their field among the positive aspects of the experimental project. Also cited as positive aspects of the project were the encouragement and confidence to reenter a career (63 percent) and the internship arranged by the college, which also gave them additional confidence in their abilities (38 percent).

The comments received on the less influential aspects of the program were quite varied; they included "Lack of practical help in job-hunting; lack of knowledge of employment problems on the part of instructors;" "Work was optional and not required, therefore various amounts accomplished;" "More emphasis on organic chemistry--theory and aspects;" "All women in the program were not on the same level in background academically, making progress slower," and "All aspects of the program were important, but the Industrial Seminar was the least--but still very helpful."

c. Site visit. The evaluation team visited Rosemont College, a small, primarily residential, women's college of approximately 600 students, during the fall of 1975. The Chemistry Department is small with a staff of three to three and one-half full-time equivalent professors. When the brochure-announcement of the NSF program was received, the department was already trying to interest local industry in a project very similar to the one conducted.

After a brief discussion of the purpose of the visit and the scheduling of the day's activities, the evaluation team was invited to sit in on an early morning student seminar. An analytic chemist from one of the participating industries was lecturing to the seven-member class on the organization and typical work problems of a petroleum company. The speaker (male) referred to chemists in general as "he" and "him" which was noted immediately by smiles and turned heads by all seven students. The women seemed interested in the technical portion of the presentation and three or four stayed after class to ask questions.

Following the class session the evaluation team met and interviewed a female research biochemist who had been with one of the participating companies for over 30 years, had only a B.A. degree, and considered her tenure and position with the company to be a significant achievement, for a woman. The company for which she worked took on two interns during the first year and hired one of these afterwards on a part-time permanent basis. The Philadelphia job market, at the time of the visit, was very poor with an 11 percent unemployment rate and the oil industry, a prime employer of chemistry graduates in the region, was doing little hiring. In addition to taking interns and assigning a liaison to the project (one-half of the biochemist's time was donated to the project), the company also put on several seminars for the students. A certain amount of propagandizing occurred in the seminars as well as in the interviews; however, the students (and the evaluators) were sufficiently sophisticated

to understand what was happening. The internships and seminars, in general, were considered to be an opportunity for a certain amount of public relations. They were said to "convert ecologists and socialists to the petroleum company's point of view and to change the image of the company to that of one participating in the common good." When asked about the relative importance of the project as it contributes to both self confidence and technical skills, the consultant replied that they were equally valuable, with the classroom work contributing primarily to skills and knowledge needed to work effectively with new processes and new equipment, and the internship provided the confidence the women need to perform effectively in a job. This view was generally accepted by the students and instructors as well.

The evaluators then met with four graduates of the program who made the trip to Rosemont expressly for the interview. Each had a slightly different reason for being in the program with needs running from economic to emotional; however, they all expressed satisfaction with every aspect of the program except for the uncertainty of job placement. The two days a week class schedule was appreciated by the women as something they could handle while the family became acclimated to a working mother. They knew they needed the additional training and the special circumstances of a supportive program to risk the commitment. The internship, paying $5.00 an hour, was important for offsetting tuition costs. Supervisors and co-workers were said to be very helpful. Two were still completing internships and were concerned about being able to find jobs. One factor that appeared to be missing in the program was more help in the area of job readiness as reflected in more personal areas: provisions for child care, knowledge of how to present one's self for employment, understanding employer needs, etc. However, as one woman expressed it when asked what she intended to do when her internship expired, "I'll look for a job as quickly as I can knowing I can be productive and valuable to industry and to myself." All four women spoke of a colleague in the program who was now working at Temple University Hospital successfully managing a laboratory there. Almost as an aside, one added, "Her husband is a physician at Temple and arranged for her interview."

The last interview of the day was with a young male visiting professor (from Villanova, with whom Rosemont has close ties) who was teaching an undergraduate class which included seven women from the program. He said his other undergraduates were much more well prepared for his course than the program women and he saw a definite difference in ability; however, the participating students worked hard and were expected to do well. In his opinion they would be "devastated" if thrown into an upper division chemistry class at a university without each other and the special help they received.

6. Secondary Outcomes

There was no discernable impact on the institution, already committed to the education of young women, except as the program strengthened the Chemistry Department. The additional few students enrolled enabled the department to have one additional faculty member who brought specialized knowledge to the department for the benefit of all. The program was said to also be beneficial to the undergraduates in the department for this reason, and also to other students who took some pride in the efforts of the returning women. The existence of the program also sparked the enthusiasm and interest of the entire department faculty which in turn affected all students. Families of the women interviewed reacted in different ways with attitudes ranging from support and pride to modest resentment. The employers, supervisors, and co-workers of the interns were said to be impressed by the competence, motivation and ability of the women chemists. The increased sense of worth the women expressed about themselves is almost certain to have additional effects unless the employment picture is so grim that disillusionment sets in to replace the glow of achievement.

7. Materials and Dissemination

No special materials were prepared for this project. A self-paced programmed text, already in use at Rosemont was effective in the introductory portion of the course. As far as we know the program has not yet been publicized to other institutions except through NSF and DRI channels.

8. Project Costs

The total cost of the program was almost $50,000 for the three-year period, including the cost of eight scholarships for which Rosemont hopes to be able to secure matching funds. The NSF share was $38,058, making the cost (assuming 12 completions) $3,200 per participant, a rather expensive program. However, students are expected to pay tuition and when their tuition is computed as income, the costs are just about offset. Administration costs would be high if the additional counseling and tutoring time and internal evaluation time were all calculated. Getting industrial support, advertising the program and providing job counseling and job placement services would probably cost in the neighborhood of $800 per participant, even with an increase in the number of students.

9. Conclusions and Recommendations

1. Updating technical skills for science graduates who

have been out of school for a number of years is essential for even the most entry level positions.

2. The all-women classes with groups of mature women together are important for this age group.

3. The two day a week scheduling is helpful in attracting students and bridging the period between home and work.

4. The seminars were more important when conducted as help sessions than as information sessions as they were originally intended.

5. The internships were invaluable because of the experience and the income they provided.

6. The women needed more assistance in complementary aspects of job preparation. Perhaps selection of under-employed women (working in sales or offices) instead of all un-employed women as participants would have increased the program's success.

7. Project data collection was unsystematic and a great deal of the information was anecdotal and from memory. No provision for follow-up of long-term effects was apparent. Special forms for data keeping purposes supplied to the project directors would have been helpful for pre-, during, and post-intervention data.

8. Funding this type of project in an area where the unemployment rate is high and likely employers are laying off workers can result in dual problems of (1) disappointment to candidates and (2) backlash among other workers. A job market analysis should probably precede the initiation of projects where there is expectation for immediate employment.

CHAPTER III
INTERIM PROGRAM RECOMMENDATIONS

The projects described in this report were aimed in general at motivating and reinforcing decisions to enter professional careers in science, for preparing effectively for those careers, and for removing barriers to the attainment of those aspirations. All of the scientific and engineering positions described in the materials developed by these projects required at least a college degree, and most required advanced degrees including the Ph.D.

A number of nontraditional nonprofessional science-related jobs exist which, for many women, would represent both economic and social benefits: electronics-, video-, sound- or flight-technicians, computer operators, highly skilled labor, etc. These are jobs that require science-oriented preparation and contribute to the emerging role of women as productive partners in providing highly specialized support skills in a technological society. Although these positions do not usually require college degrees or the same high degree of academic learning ability, they do require early exposure and commitment, continued encouragement, and special training. They represent improved earnings and more respected skills than many traditionally female jobs, and for these reasons it may be just as desirable to increase the number of women participating in these careers.

Many of the recommendations of this report, especially at the primary and secondary school levels, apply equally to a host of nontraditional jobs, especially those that are highly technical, and should be read with this consideration in mind.

A. Concentration on Women With Above Average Aptitude and Motivation.

Realistically, professional careers in science-related areas require intellectual ability, an adequate background derived from math and science courses, and more than average motivation. In fact, having completed advanced mathematics and science courses successfully is probably a good indicator of ability and motivation. Although there is a controversy about the measuring of aptitude and ability (e.g., Wilson, 1967), it seems feasible to determine whether individuals have at least average ability or are highly motivated by utilizing either standardized test scores or grade point averages. Many studies have shown a relationship between career commitment in general and measures of accomplishment and/or aptitude (e.g., Hoyt and Kennedy, 1958; Metzger, Bollman, Hoeflin and Schmalzried, 1969; Tyler, 1964; and Watley, 1969). Further, a higher level of aptitude appears to be related to the choice of nontraditional careers, e.g., those occupations dominated by males (e.g., Austin, 1971; Rezler, 1967). Consequently, it would appear that intensive and/or expensive programs should concentrate on women who have either a high ability (for early high school years) or who have taken the necessary requisite courses (later high school years). This recommendation is congruent with that made in the final

report of Policy Studies in Education. Further, the University of Kansas Program and Policy Studies used about the same material, but higher ability women were the participants at Kansas. This may, in part, be reflected in the generally more positive outcome at Kansas.

B. Concentration on Content With High Ability and/or More Mature Women

The site visit interviews with the participants have suggested to the evaluation team that lower ability and younger women are more interested in "lifestyle" questions, e.g., whether it is possible to have both a family and a career, rather than the day to day activities encompassed by the job. This was indicated by the Kansas participants who were high ability seniors, and were less positive about the self awareness proportions of the project. In comparison, the women involved in the Policy Studies Program, a year or two younger and not exclusively high ability, commented more frequently on family arrangements, etc. Finally, the MIT project reported some split between those most interested in knowing more about job content, while some were interested in life syles. Although the responses were not analyzed for his purpose, it is possible that this split occurred by age and/or ability. There is a suggestion in these reports that an age-ability trade-off may occur, e.g., the higher the ability, the lower the appropriate age.

C. Concentration on Women who are Already Interested in Science Careers at the Senior High and College Levels

This conclusion is dictated by the requirements for a career in science-related areas. That is, beyond the junior year level, if the women have not already had the requisite courses (an indication of interest) they will likely not be able to take them without additional time in school. Further, by their senior year most women have some idea of how they will spend the next four years. This recommendation is congruent with the MIT and Kansas reports that spring of the senior year was "too late" to recruit women.

D. Differentiating Between Career Education and Programs to Encourage Women to Choose Science as a Career.

This conclusion is drawn from the recommendations to concentrate on high ability women, women who have already expressed an interest in science and/or who have taken the necessary courses by the senior high level. Utilizing some of the media products and portions of the Kansas and Policy Studies Programs to make young women aware that science is a career option and to encourage them to obtain the necessary background (e.g., math and science) to keep those career options open is important prior to the senior high level. These programs could be done inexpensively, reach a large number of students, do not necessitate "special" programs for women, and become part of the career education classes in the school systems. These programs could incorporate "lifestyle" considerations of a career. However, since these projects (understandably) do not appear to be successful in changing occupational choices at the senior high level, more intensive support could be given to those women having the necessary background, ability and

motivation to pursue their existing interests. At this level, more detail about job content could be discussed.

While there is not an established theory on the vocational choice patterns of women, there has been a growing number of studies in the area. Most of the literature appears to be in agreement that young adolescent females express more varied and sophisticated occupational preferences (e.g., Harmon, 1971). A drop in career commitment has been noted in junior and senior high school women (Matthews and Fiedeman, 1964). In the freshman year of college career commitment is also low and continues to decline until the senior year where there is a resurgence of commitment (Angrist, 1970).

There is ample evidence that many, if not the majority, of women shift in vocational preferences during these years, and as many as a third may still be undecided during their senior year in college (Angrist, 1970). The shifting patterns are important for programs designed to encourage women to choose science as a career; the literature uniformly indicates that from preadolescence on, the shift is toward typically feminine careers and away from nontraditional careers (e.g., Angrist, 1970; Harmon, 1971; Schmidt, 1970). Most important to the shift in occupational preferences is that it is difficult, if not impossible, to shift from a nonscience to a science major in the final year of college without significantly prolonging the time required to obtain a bachelor's degree.

Despite the fact that occupational preference may change, commitment to a career, and whether that career will be nontraditional, can in some instances be identified with some reliability by the tenth grade in high school (see pp. 65-66).

E. Sex Segregation of Some Classes

Although in theory, as well as in practice, sex-segregated classes might be considered counter productive since women live and work in a world with men, a consistent comment on the part of the participants was that they preferred all female seminars. This comment extended to a preference for female tutors in math. The young women commented that they felt more free to ask (what they considered) "dumb" questions, to appear as "bright" as they are, and to discuss their personal life and ambitions. Consequently, although a sad commentary on socialization and peer pressure, sex-segregated classes appear to be useful in situations where remediation skills or personal questions are involved. These classes, however, could incorporate methods or lead to more open discussions with male peers and parents, once the women have gained self confidence and support from same sex peers.

F. Use of Role Models

Uniformly, role models appeared to be the most effective component of some of the projects (Kansas, Policy Studies, UMKC and Rosemont) and were the exclusive material for the media products (MIT and Queensborough). The original connotation of a role model was

a person in a position of influence that one could identify with; most of the projects did incorporate these younger, accomplished women in mid-level prestigious positions. In one of the projects containing a mix of role models (Policy Studies), the younger women were judged most effective by the participants. In this respect, then, choosing the role models closer in age and only slightly above the level of aspiration of the participants may be advisable.

The evaluation team, however, feels that there is also real value in depicting the most successful of our time. Although very few women (or men) may be able to identify with them, they demonstrate that a woman can "make it," they are a source of pride for the female sex, and serve as an inspiration. Consequently, a mix of age groups and levels of accomplishment (as well as life styles, ethnicity and so on) is recommended.

The area of concentration of the role models did not appear to have any impact; the more important factor was that they genuinely enjoyed their work and their lives.

G. Reentry Programs Concentrate on Underemployed Women

It is suggested that reentry programs for mature women might utilize already working, but underemployed, women. Updating the skills of women already in the labor force might alleviate recruitment problems and employment placement. These women would have already adjusted their family arrangements to meet their work schedules, and have shown that they are motivated for employment. They may be currently underemployed, e.g., rather than capitalizing on their scientific skills, they may be working as secretaries, sales personnel or other jobs unrelated to their training. The major obstacle to this approach would be that their families may be accustomed to or dependent on the additional income, and a period out of the labor force to update their skills may impose an economic hardship for them.

H. Dissemination of Activities

Some of the projects have engaged in fruitful activities to disseminate their "products." These appear to be successful. However, since these have occurred through different outlets, a compilation of these activities might be produced by NSF. Since it is felt that several projects overlap in the materials developed (e.g., Policy Studies and Kansas) and others project products (e.g., the film and media packets) could be used co-jointly in the context of other programs. A compilation of all projects designed to encourage women to choose science as a career could be an aid to science teachers and career educators to choose the material most appropriate for their classes (see Appendices C and D for an incomplete compilation of related materials).

I. Use of Standardized Evaluation Tools

If experimental projects are to be continued to encourage women to choose science-related careers and the independent measure is a questionnaire of any kind, the evaluation team feels very strongly that reliable and validated instruments should be provided for use by the project directors. Each of the projects has designed at least one such instrument, and the best items could be chosen and validated from this pool. It is felt that a standard unit of measurement could be developed for all similar projects. Even if a project wanted to have additional dependent measures, at least a comparison, either of the project outcome or its evaluation methodology, would then be possible. While it is recognized that a single instrument may not be appropriate for all types of experimental designs and that the use of a validated instrument will insure neither superior experimental nor evaluation procedures, no entirely valid measures for assessing women's occupational preferences or career commitment currently exist (e.g., Harmon, 1961; Harmon, 1967).

J. Intergovernmental Conference and Delineation of Activities

There are several federal agencies currently working in the area of career education with some emphasis on women. These include the Women's Educational Equity Act (OE/HEW), Education and Work Group (NIE) and Office of Career Education (HEW). Ideally, full sharing of resources should occur. In addition, some delineation of areas of concentration might be possible. For example, NSF might focus on high ability women interested in science, and only assist Office of Career Education in making younger women aware of nontraditional career opportunities. Further, OE/HEW is already planning dissemination activities for similar programs and NSF could add their material to this clearinghouse.

K. Continuation of Activities by NSF and Dissemination of Knowledge About its Programs

In addition to the increase in knowledge gained by the experimental projects, the team has observed some psychological benefits just from the existence of the program. Even the participants commented that they were impressed that "somebody" was interested in their careers. Further, in the current climate of the women's movement and the possible defeat of the ERA, the existence of federal interest and support is imperative for the morale of the people committed to career/life options for women.

In summary, a distinction between general career education and special programs to encourage women to choose science as a career should be made. However, in both kinds of programs, sex segregated classes and the use of role models appear to be important components. It is

recommended that programs designed to encourage women to choose science-related careers concentrate on women of above average ability and/or grade point averages, who are well motivated, and who have already expressed some interest in science-related careers, either by means of the courses they have taken or by self report. In many instances, educational materials designed for these programs for a given age group, may also be appropriate for a younger age group of higher ability women.

There seems to be more potential for increasing the participation of women in science by concentrating on women who are already working but are underutilizing their skills. Recommendations for federal government interventions include the use of validated measurement instruments, additional dissemination of project materials, intergovernmental agency coordination, and continued activities on the part of the National Science Foundation to encourage women to choose science as a career.

CHAPTER IV
ALTERNATIVE INTERVENTIONS

There are many barriers to account for the lack of participation by women in nontraditional science careers. These psychological, sociological and institutional barriers have been systematically laid out by Dr. Smith at the University of Kansas (1976). His delineation of the barriers is given in Table 1.

There are a wide variety of interventions or treatments which may serve to overcome these barriers and to encourage women to choose science-related careers. These vary by age group, comprehensiveness and area of focus. Generally speaking, programs for young women may be considered career education and are less specific to science. Further, programs offered in earlier years may be considered as recruitment, while programs for college age may concentrate on support and retention.

Many of the potential programs listed below are not within the charter constraints of the National Science Foundation. Because it is felt that a sustained effort, reaching each female as continuously as possible throughout her formative years, may be necessary to counteract society's socialization processes, many programs are listed.

The list of programs is divided by educational level. The assumption underlying these programs is given first. The list is not complete, and is intended to act as a "working draft," and is laid out in Table 2.

A. Elementary School

There are many reasons for lack of female participation in scientific careers. A number of the reasons can be sufficiently stated in the generality that neither males nor females, whether young or mature, expect women to have careers in science. The result of this "nonexpectation" results in psychological, sociological and institutional barriers.

The psychological variables are related to sex role socialization; sex role socialization refers to the differential processes and experiences used to prepare males and females for the roles that society defines as being appropriate for their sex. This "social shaping" is conducted by the adults responsible for the child's care to deliver rewards and punishments contingent on whether the child's behavior is sex appropriate. The other means is by example: children imitate people the same sex as themselves. This begins at birth and may clearly be seen in a child's preferences for toys by age 2 (cf. Maccoby and Jacklin, 1974). There is some evidence to indicate that males become sex-typed at an earlier age than females; in fact, there may be a decline in sex typing among girls between the ages of five and ten (see Fling and Manosevite, 1972, for a review).

TABLE 1

Barriers Proposed as Affecting Career Choice of Women

Role Conflict (Career Person versus Parent)

1. Women feel a long-term commitment to a career interferes with raising preschool children.
2. Women feel a long-term commitment to a career interferes with raising a family.
3. Women feel that their basic responsibility is raising the children in our society.

Role Conflict (Career Person versus Spouse)

4. Women feel that a husband's success is more important than a wife's success.
5. Women feel they should adjust their career goals in order not to interfere with their husband's success.
6. Women are not free to move to new locations as career opportunities open in their field.
7. Women feel a strong career commitment interferes with a happy marriage.

Family's and/or Friends' Opposition to a Career

8. People who are important in a woman's life (that is, family and friends) believe a woman's place is in the home.
9. People who are important in a woman's life (that is, family and friends) do not think it is appropriate for a woman to pursue a professional career.

Lack of Opportunity (in Jobs)

10. Women who are trained in science fields do not have as many job opportunities as men.
11. Women have not been informed of job openings in traditionally male science careers.
12. Women are not as aware as men of the variety of available science careers.

Lack of Opportunity (in Education)

13. Women with math and science ability do not have the same educational opportunities as men. For example, women have more difficulty getting into medical school than men.
14. Senior high women are discouraged from pursuing the science and math courses which would prepare them to pursue science majors in college.

TABLE 1 (Continued)

Fear of Success

15. Women fear the consequences of being highly successful in their careers.
16. Women do not want jobs that involve professional responsibility and commitment.

Lack of Professional Support

17. Women scientists are out of the mainstream of important professional contacts.
18. Women who are scientists are not supported and not kept informed by fellow professionals. For example, women do not receive up-to-date information about research possibilities.

Lack of Natural Ability

19. Women do not feel competent enough in math and science areas.
20. Women do not have a natural bent for solving problems and therefore do not have a natural ability to be scientists.

TABLE 2

Assumption	Elementary School Programs	High School	College	Graduate	Reentry	Post Employment
Knowledge that science-related careers are open to women is a prerequisite for pursuing those careers	1. Use of nonsex stereotyped depicting of occupations in printed material 2. Programs to reach elementary school teachers and administrators 3. Efforts to eliminate current sex role specialization in school systems	1. Use of nonsex stereotyped depictions of occupations in printed matter and "career day" programs 2. Programs to reach high school teachers, administrators, and especially counselors 3. Efforts to eliminate current sex role specialization in the school systems	1. Workshops and seminars portraying professional women in science careers 2. Increase in number of female science professors			
Many women capable of pursuing science-related careers lower their aspirations because of peer and parent pressures and concern for popularity and future familial relationships		1. Making males and females aware of career alternatives 2. Making males and females aware of satisfying nontraditional family relationships 3. Encouraging young women to discuss career options with their parents				

TABLE 2
(Continued)

Assumption	Elementary School Programs	High School	College	Graduate	Reentry	Post Employment
Many women fail to pursue science-related careers because they fail to successfully complete prerequisite mathematics preparation		1. Programs emphasizing long-range planning including continuation of mathematics 2. Innovative methods of teaching math adapted to the strengths of females 3. Special tutorial programs	1. Remedial math courses 2. Innovative teaching methods 3. Special tutorial programs			
Career committed females may benefit from special counseling support group activities		1. Identification of career committed females	1. Special counseling and support groups 2. Special housing			

TABLE 2
(Continued)

Assumption	Elementary School Programs	High School	College	Graduate	Reentry	Post Employment
Tangible and intangible institutional barriers discourage women from pursuing science-related careers			1. Increasing number of undergraduate assistantships 2. Increase women in coop and intern programs 3. Rewriting "fellow"ship brochures 4. Increase female faculty	1. Provide more financial aid 2. Adapt financial aid provisions to meet the needs of women 3. Increase in number and status of female faculty 4. Special programs to encourage Ph.D. completion		1. Repeal of anti-nepotism rules 2. Tenure and fringe benefits for part-time employment 3. Split positions and flexible hours 4. Equalization of pay scales
Women reentering labor market have special needs					1. Programs to update previously learned skills 2. Special counseling programs 3. Assistance in job placement	

TABLE 2
(Continued)

Assumption	Elementary School Programs	High School	College	Graduate	Reentry	Post Employment
Women beginning or continuing formal education in their mature years have special needs					1. Special vocational guidance programs 2. Use of CLEP and related programs 3. Increase in assistantships 4. Increase in coop and intern programs	
Increasing the awareness of the status of women by the working community will (1) increase job satisifaction, (2) increase the number of females in the labor force, and (3) may alter the stereotypes that employees convey to their children						1. Workshop/seminars of employees on the status of women 2. Soliciting industrial support for women's programs

Assumption: Knowledge that science-related careers are open to women is a prerequisite for pursuing those careers.

Possible Interventions.

1. Use of nonsex stereotyped depicting of occupations in printed material. One method of informing girls of the career options they might pursue is concern for the portrayal of women in textbooks, vocational material, comic books and so on. This effort should include an emphasis that most women will eventually be in the labor force, and cannot be housewives and mothers throughout their lives, even if they desire to.

2. Programs to reach elementary school teachers and administrators. A complement to careful attention to the use of written materials is the attitudes of the people interacting with the children. Conscious efforts to avoid stereotyping, either by omission or commission, should be done by the teachers. Workshops on sex stereotyping for teachers and administrators (and parents if possible) could be conducted to make them aware of their own stereotypes which they subsequently relay to the children.

3. Efforts to eliminate current sex role "specialization" in the school systems. An obvious means to decrease job/sex stereotyping is to eliminate the most visible source of stereotyping observable by children, e.g., the school system itself. This would suggest elimination of teaching as a "woman's" profession, and administration as a "man's" profession, and to increase the number of female administrators and male teachers in the school system.

B. Junior and Senior High School

Role imitation and reinforcement by parents is augmented by peer pressure in adolescent years, where fear of not being socially acceptable is frequently translated by women into not appearing brainy or taking "hard courses" like math (Levine, 1976). This may account for the drop in career commitment from junior to senior high (Matthews and Fiedeman, 1964). Late adolescence may also be a period of greater identity with stereotypically femine sex role characteristics (Long, Zellar, and Henderson, 1968). The result of sex role stereotyping may be seen in the career interests patterns, curriculum selection and other factors which will heavily influence their subsequent lives.

Assumption: Knowledge that science-related careers are open to women is a prerequisite for pursuing those careers.

Possible interventions.

1. Use of nonsex stereotyped depictions of occupations in printed matter and "career day" programs. Portrayal of both sexes doing a wide variety of jobs might not only encourage both sexes to consider a wider range of career alternatives, but may prepare the way for more pleasant on-the-job interactions for those choosing nontraditional alternatives. These career days should include exposure to women in science careers.

2. Programs to reach high school teachers, administrators and especially vocational counselors. Since the basic preparatory courses are taken in the high school years and preliminary, if not final, vocational decisions are made at that time, it is especially important for young women to be aware of the range of career options open to them. These options are conveyed to them by the adults interacting with them, e.g., their parents, teachers and counselors.

The limited vocational considerations given by young women is heavily encouraged by sextyping on the part of high school counselors. A selected annotated bibliography on career counseling (1972) cites a large number of studies documenting sextyping by vocational counselors. Therefore a special effort should be made to encourage high school counselors to consciously inform women about potential opportunities. Since many counselors may not be aware themselves of changing trends in opportunities for women, workshops (like the NSF-sponsored Michigan Tech workshop) may increase their knowledge.

3. Efforts to eliminate current sex role "specialization" in high school systems, including more female science and math teachers. Since the school system itself is the most visible "world of work" observed by the teenagers, it is important that job/sex stereotyping does not occur, e.g., a mixture of male and female teachers in all disciplines including science, and an "integrated" administration.

Assumption: Many women capable of pursuing science-related careers lower their aspirations because of peer and parent pressure, and concern for popularity and future familial relationships.

The underlying assumption is that altering the stereotypes of young males, as well as the females is an integral part of encouraging women to prepare for science-related and other nontraditionally female

careers. Since many young women are influenced by their male peers, making nontraditional careers "acceptable" to the males may result in fewer women altering their career aspirations.

Possible interventions.

1. Making males and females aware of nontraditional career alternatives. (See 1, p. 64)

2. Making males and females aware of satisfying nontraditional family relationships. A concomitant awareness for both males and females is that persons who choose nontraditional careers are not "weird" and may have satisying family/spouse relationships, since this is a high level concern for that age group. Many of the young people may only be acquainted with one alternative for family living, e.g., mother at home, father at work. Alternative family/spouse relationships and living styles could be discussed during career education, "hygiene" and related courses.

3. Encouraging young women to discuss career options with their parents. Most female children do not seriously discuss their career aspirations with their parents as much as most male children do. Based on the responses of the young women participating in the University of Kansas workshops, many of them felt their parents would disapprove of their plans or not take them seriously. Most reported being very pleased at the amount of support they got from their parents. Consequently, inviting parents to separate, concurrent or mixed career workshops with their children may be a very powerful tool.

4. Identification of and special counseling for "career committed" young women. Recent research has shown an attempt to identify nontraditional "pioneers" or career oriented women by about tenth grade in high school, and identify science vs. nonscience oriented commitments (e.g., Astin, 1968; Fortner, 1970; Masih, 1967; Mooney, 1968; Mowesian, R., Heath and Rothney, 1966; Rezler, 1967; Schissel, 1968; Wokkon, 1970; Brown, 1975; Kotcher and Gellman, 1976).

The profile of the career committed female shows that she attends a large high school, and has had career counseling by ninth grade (Astin, 1968). Girls who have high ability, especially in mathematics, choose fields that require greater commitment (Astin and Myint, 1971). They are more likely to have a father in a white collar occupation (David, 1971), and tend to identify more with their fathers (Johnson, 1970), come from upper middle class families, had better educated mothers, and approved of a variety of career roles for women (Levine, 1968). She perceives herself as capable of enduring long periods of work and has a high need for achievement (Masih, 1967). If she has high degree of career commitment, she is likely to choose an atypical occupation. She is more likely to be Jewish, live in more heavily populated areas, be the second born child (Wolkon, 1970), and have a "masculine" self perception (Kotcher and Gellman, 1976). She

is more uncertain on vocational choice if she has high ability in math and science (Sedlackel, 1968).

If, in fact, these women can be identified, special counseling and/or seminars and workshops should be available to them. The content of the workshops could include extensive information regarding professional careers and concomitant lifestyle arrangements.

Assumption: Many women fail to pursue science-related careers because they fail to successfully complete prerequisite mathematics preparation.

One of the most limiting factors for women in choosing careers may be their inadequate background in mathematics. If women have dropped mathematics from their curriculum after high school algebra, their career options are subsequently severely limited in the direction of traditionally "women's" jobs, e.g., all of the physical sciences, the natural sciences and most types of business administration are no longer open to them without remediation of their mathematical skills.

Males have always scored considerably higher on tests of mathematical ability at the college entrance levels. This does not appear to be caused by an inherent lack of ability in mathematics in females. There are no sex differences regarding numberical ability during the preschool years (Shipman, 1971); in fact, young girls appear to be ahead of the males. The majority of studies show no sex differences in mathematics up to adolescence, but when differences are found in the age range of nine to thirteen, they tend to favor boys (Maccoby and Jacklin, 1974). Further, the males score dramatically higher by their senior year in high school (Flanagan, 1961). This trend, however, is not cross-cultural, e.g., similar studies in Sweden show only a very small difference at the senior high level.

There are a variety of factors influencing the mathematical ability test scores. Males tend to take more math courses, either because they perceive that they will have a greater need for them, they received encouragement not given to girls by counselors and parents, or peer and self expectation levels. However, when the number of math courses taken in high school is equalized for males and females, males still emerged with substantially higher averages (Maccoby and Jacklin, 1974). Factor analysis of mathematical aptitude tests suggest that women do better on verbal items, while males did better on visual-spatial portions (e.g., Smith, 1964; Werdlin, 1958). Moreover, a space factor emerges as an element in mathematical skills for males but not females (Werlin, 1961). Therefore, mathematical ability is not a unitary factor, and there are different ways to attack mathematical problems, and individuals differ in the cognitive abilities they characteristically bring to bear on this problem. Maccoby and

Jacklin (1974) plead for more understanding of mathematical "styles."

Possible interventions.

1. Programs emphasizing long-range planning, including continuation of mathematics. An important concept to convey to young women is the high proportion of women who do work for some part of their lives, e.g., very few women have a stable career as a housewife and mother, or a short-term career that will be satisified by short-time career preparation, e.g., office work. Consequently, young women should plan on work, and on making those years the most satisfying and productive possible. There are at least three reasons reported by women as to why women don't complete advanced mathematics. They are: many women think that they will not need it, will not do well in it and/or do not like it. Programs emphasizing the role of work in their lives and the necessary preparation for certain careers could be given directly to the young women or workshops to increase teacher and counselor awareness could be conducted.

2. Innovative methods of teaching math adapted to the strengths of females. Many females have higher verbal scores than math scores on standardized achievement tests. Consequently, they may be more confident in solving problems in a conceptual manner. It is possible to adapt the method of teaching mathematics in order to capitalize on these strengths. For example, problems might be solved conceptually or verbally and then "translated" into mathematics. Innovative teaching methods could result in decreasing the fear and increasing the confidence and enjoyment with which many women approach mathematics.

Assumption: Courses and activities related to science may increase interest, confidence and aptitude in science careers.

Possible interventions.

1. Availability and encouragement to include other courses that would increase their interest and aptitude in science. A variety of courses may serve to increase the number of women in science-related careers by increasing their confidence in pursuing them. These courses, frequently taught at the secondary level, would include auto mechanics and shop.

2. Availability and encouragement to enter science clubs, fairs and special programs, such as those sponsored during the summer of the junior year by the National Science Foundation. Interest groups, fairs, etc. may increase the interest, or sustain the interest in science for teenage women.

C. Undergraduate or College Level

Assumption: Knowledge that science-related careers are open to women is a prerequisite for pursuing those careers.

Possible interventions.

1. *Workshops and seminars portraying professional women in science careers.* Several NSF-sponsored projects are implementing this approach; e.g., Mary Baldwin College was funded for seminars in 1975, and many more have been funded in 1976. These workshops might encompass three components of discussion by or with the role models. The three are: actual job content, lifestyles and on-the-job problems. Depending upon the interests of the participants, the various aspects could be differentially emphasized. For many science majors, the different job titles that may be pursued from a science major may be of the most interest. For other groups, lifestyle solutions and preparation of on-the-job problems (if any) may be of more interest.

2. *Increase in the number of female science professors.* Even though the majority of women having careers in science specialize in teaching, the percentage of full professors is very low in the sciences. The most obvious and most available role model for women interested in science would be their professors. In addition, it is likely that female professors may be more supportive of female undergraduate majors than male professors. Therefore, programs to increase the number and status of female professors is encouraged. The programs to increase the number may encompass all of the programs suggested in this section, and there may be many years before results are observed. Direct support of programs to increase the status of current female professors may produce results in a shorter time period. Many such programs are referenced in the section on programs for women currently in the labor force.

Assumption: Career committed females may benefit from special counseling, support group activities and other forms of social encouragement.

Possible interventions.

1. *Special counseling or support groups for women planning to pursue nontraditional science careers.* This special counseling or support groups may take many forms. The groups might be task oriented around special courses that would interest primarily females or be more social in nature. Whatever the vehicle used, the major aim would be to decrease the alienation and social pressure by encouraging friendships among women with similar values and aspirations.

2. Special housing for women planning to pursue nontraditional science careers. While special housing presents many difficulties at large universities, group housing has been shown to increase the retention rate of female engineering majors (see Brown, 1975). Wherever this may be an option, different housing arrangements may be tried.

Assumption: Many women fail to pursue science-related careers because they fail to successfully complete prerequisite mathematics courses.

Possible interventions.

1. Remedial mathematics courses. Offering "remedial" mathematics courses or special courses such as the UMKC project, may be an appropriate vehicle to assist women who are interested in science, but have difficulty in advanced level courses because of inadequate backgrounds in math. These are probably most successfully taught in an innovative manner.

2. Innovative methods of teaching for advanced mathematics. Even for those women successfully completing mathematics at the high school level, innovative approaches to teaching mathematics could be applied to advanced courses, such as solid geometry and calculus (see Sec. B).

3. Special tutorial programs. For women taking advanced mathematics courses in college, special tutorial programs, run by other women might assist their colleagues. The women interviewed at the University of Kansas expressed their shyness with male tutors, and reluctance to ask the teachers for help. They felt that not understanding a single lesson usually meant it was impossible to comprehend any subsequent lesson. Therefore, they wanted female tutors who were immediately available and consistent.

Assumption: Tangible and intangible institutional barriers discourage women from pursuing science-related careers.

Not only do women pursuing nontraditional careers encounter social barriers, they frequently encounter institutional barriers. Even those schools professing equal opportunity for financial aid, intern programs, etc., frequently have not adapted them to the special needs of women.

Possible interventions.

1. Increasing the number and percentage of women holding undergraduate assistantships in teaching and research in the sciences. One of the "spin-off" effects of at least one of the experimental

projects (not currently complete) appeared to be the very positive effects of the junior and senior science majors hired as staff personnel. It not only served as a financial aid, it was interpreted as a "vote of confidence" and served to increase their interest, exposure and expertise in their areas. Assistantships also provide additional encouragement to go to graduate school, and usually provide a closer relationship with a faculty member. Assistantships to declared science majors may improve the retention rate and result in more women attending graduate school in science.

2. *Increasing the number and percentage of women in science-related coop and intern programs.* One of the current NSF-sponsored projects is attempting this program. Such programs should result in a better understanding of job options, job requirements and preferable job alternatives (discovering that one doesn't like a job is as important as discovering that one does). Further, it may provide better "connections" to obtain a job or to gain admission to graduate school.

3. *Rewriting graduate "fellow"ship brochures.* One discouraging factor in applying for graduate school is the way information on financial aid is presented (Nies, 1976). The brochures, especially on the most prestigious "fellow"ships are uniformly written in masculine gender and appear to rule out women.

4. *Increasing the number and percentage of female science professors (advisors).* (See p. 68)

D. Graduate School

The National Research Council reports that the number of doctoral degrees granted to women between 1970 and 1974 was 8.4 percent of the total in math, 3.3 percent of the total in physics, 9.0 percent in chemistry, 3.7 percent in the earth sciences, and .8 percent in engineering. The percentage of female doctorates has declined when compared to the years 1920-29 in almost all instances (the percentages in the life sciences has remained relatively constant). All of these fields, however, showed a slight increase between 1973 and 1974.

The percentage of females that hold M.S. in the sciences is proportionately larger than doctorate degrees. For example, 13.4 percent of the M.A.'s in the geosciences were female and 24.5 percent in math. The percentage typically increases further in the number of undergraduate majors.

David (1971) concluded that "earning a doctorate is the factor that most equalizes the women to the men in science and engineering" (p. 222), in terms of employment, salary and contribution to their field.

However, barriers to women pursuing science occur through the educational system. It is likely that one of the most discouraging aspects of pursuing a graduate degree are the institutional barriers that preclude a family life. Therefore, the next section concentrates on institutional barriers.

Assumption: Tangible and intangible institutional barriers discourage women from pursuing science careers.

Possible interventions.

1. *Provide more financial assistantships to women in the sciences.* Discrimination in granting fellowships, which serve to increase self confidence, add to qualifications, as well as aiding financially, is common. For example, consistently less than 3 percent of NASA fellowhips go to women (about twice the rejection rate for females as males), and about 18.7 percent of NSF fellowships to women in 1972-73 (Nies, 1976).

2. *Adapting financial aid provisions to meet the needs of women.* Financial aid provisions are typically designed around the "male model," e.g., they do not have flexibility in the number of hours, scheduling and so on. Provisions for less than full course load, child care provisions, and eligibility when enrolled nonconsecutive quarters or semesters would enable more women to complete course work and laboratory requirements and encourage sustained pursuit of graduate degrees.

3. *Programs to increase the number and status of female science faculty.* One of the major determinants of degree completion may be the faculty advisor. Not only would all of the forementioned comments concerning females in faculty and administration apply, but the additional factor of understanding of problems of the female graduate student and support of her ambitions might occur more frequently with female advisors.

4. *Special programs to encourage completion of the Ph.D.* Women tend to pursue graduate education but a lower proportion receive degrees (David, 1971). If the Ph.D. is an equalizing factor in employment, salary and accomplishment, special programs to encourage completion (and to contribute to the supply of role models and female faculty members) should be conducted. These programs might include female colloquium speakers, support groups, internships, workshops and seminars.

E. Post Grad Reentry Programs

NSF has sponsored a project to update the skills of mature women who have been out of the labor market, but are graduates with majors in chemistry. The Foundation is funding many more of these projects in 1976. These programs are especially important since many women either reenter careers, start new careers, and start or continue their educations after their child bearing years.

Assumption: Women reentering or entering the labor market in their mature years have special needs.

Possible interventions.

1. Programs to update previously learned skills. The logic of these programs is to build on skills acquired years ago and to make them applicable to the current instruments and job market.

2. Special counseling prior to and during entry in the labor force. It has been argued that mature women have intense counseling needs to adapt patterns of family life and to attack confidence problems. Consequently, counseling programs might be incorporated into updating skills programs.

3. Assistance in job placement. Another component of reentry programs may be direct aid in job placement, including the use of intern programs.

Assumption: Women beginning or continuing formal education in their mature years have special needs.

Possible interventions.

1. Special vocational guidance programs. Since women in their mature years may not be as influenced by peer pressure and "fear" for their future family/spouse relationship, they may be more likely to choose science or math careers. Special programs should be conducted to make them aware of their career options.

2. Use of CLEP and related programs. Many women continuing their undergraduate careers may be able to exempt certain courses by using the CLEP program. Such programs might decrease time pressures in order that lab courses could be more easily completed.

3. Increasing the number of mature women receiving graduate and undergraduate assistantships in science. The "vote of confidence" given by such assistantships may be especially valuable to mature women, and may serve to increase their professional job entry level.

4. Increasing the number of mature women participating in coop and intern programs. Coop and intern programs may be especially valuable to more mature women, since they may be more serious about their careers than younger women, and may spend more uninterrupted years in the labor market.

F. Post Employment

According to the National Academy of Sciences 1973 report, the unemployment rate for female Ph.D.'s (at only 3.9 percent) is nevertheless more than three times that of men. However, the percentage of women in the work force decreases with a decrease in the highest educational degree.

Women are as likely as men to remain with their employer and do not change jobs more frequently, although they receive less salary than their male colleagues, even when education, experience, etc., are taken into account.

Most of these programs represent institutional barriers that make working difficult, if not impossible, during the period that children are young.

Assumption: Tangible and intangible institutional barriers discourage women from pursuing science-related careers.

Possible interventions.

1. Repeal of antinepotism rules. The result of antinepotism rules is that it is more difficult for women to get professional jobs for which they are qualified and decreases their status and numbers on university faculties. One school visited by the evaluation team actively recruited wife/husband teams. The consequence was a higher proportion of female faculty members, and a longer tenure of faculty members.

2. Tenure and fringe benefits for part-time employment. If women could accrue tenure positions while working part-time, an incentive to remain part-time in the labor market during child bearing years would be provided. The part-time employment would result in her not losing touch with her field, and make full-time reentry less difficult.

3. Split positions and flexible hours. A few innovative institutions now have "split positions" which enable a wife/husband team to share a job, or any two people to share a job. This arrangement also makes it more convenient for a woman to continue employment.

4. *Equalization of pay scales.* One obvious way of increasing women's participation in the work force is to make it more lucrative for them. Further, it is demoralizing for women to work at the same job and do the same quality of work as her male colleagues, but be paid less.

Assumption: Increasing the awareness of the status of women in the working community will (1) increase job satisfaction, (2) increase the number of females in the labor force and (3) may alter the stereotypes that the employees convey to their children.

Possible interventions.

1. *Workshop/seminars of employees on the status of female professionals.* These workshops should be aimed at decreasing the job/sex stereotyping. If sex stereotyping is ameliorated, the female employees should experience greater job satisfaction and less interpersonal friction on the job. Second, it may provide an atmosphere where men and women help younger entering women. Third, increased awareness of stereotyping behavior may result in the hiring of more female personnel. Finally, increased awareness may also alter the manner in which the employees, as parents, socialize their children.

The format of these workshop/seminars could be varied. It should be noted that the potential results, although laudable, are also ambitious, and would not likely result from a single workshop.

2. *Soliciting industrial support for women's programs.* There are many advantages to the industrial support for women's programs. First, it expands the funding base of these programs and may enable more extensive interventions. Second, it is a convincing demonstration to women that job opportunities may be open to them. It may also increase counselor and teacher awareness of job opportunities. Finally, it provides a psychological boost to project personnel to have private sector support, which has been traditionally conservative.

APPENDIX A

SITE VISIT OUTLINE

Institution:

Project Number:

Principal Investigator:

Original Design of Experimental Project

A. Rationale of project designed:

B. Stated objectives (hypotheses):

C. Independent variables (treatments):

D. Dependent measures:

E. Sample:

	Experimental	Control
1. age		
2. number		
3. ability in science		
4. interest in science		
5. sex		
6. other variables (ethnic, suburban, etc.)		
7. recruitment procedures		

Project Implementation

A. Changes in rationale (if any):

B. Changes in goal (if any):

C. Any other procedural deviations (schedules, etc.):

D. Actual sample

	Experimental	Control
number contacted		
number participating		
number (%) completing (retention)		
factors influencing participation and/or attrition		

Participants

A. Describe any distinguishing characteristics not covered by "sample":

B. Other comments:

Project Personnel

Total number of personnel interacting with participants

A. Scientific background:

B. Commitment to open career options:

C. Perceived attractiveness by participants:

D. Perceived credibility by participants:

E. Motivation for instituting project:

F. How heard about program:

G. Sex of personnel:

H. Other comments:

Type of Communication

1. Modalities (print, etc.):

2. Format (sequence of presentations, etc.):

3. Actual content (realism, etc.):

4. Relevance of content to background of participants:

5. Number of disciplines discussed:

6. If more than one type of communication was used, which type was most effective?

7. Which (content area) of each type of communication had most impact:

8. Comments:

Institution

1. Type of school (liberal arts, etc.):

2. Geographic location:

3. Degree and type of institutional support and commitment at program inception:

4. Adequacy of facilities for conducting the project:

5. Possibility for program continuation in absence of NSF funding:

6. Institutional ratio of males/females:

7. Comments or distinguishing characteristics:

8. Attitude changes with institution members because of the program:

9. Behavioral changes in institutional members because of program:

Cost Variables

1. Total cost per participant $\left(\frac{\text{number participants}}{\text{total budget}}\right)$

2. Cost and time to prepare course materials:

3. Cost to administrate $\left(\frac{\text{program cost-cost to prepare}}{\text{number of participants}}\right)$

4. Cost to use if number of participants were increased:

5. Cost to reuse with same number of participants:

6. Time commitment by participants:

7. Cost in comparison to alternative, similar programs:

Overall Evaluation

A. Program Conception

1. Appropriateness:

2. Validity and utility in meeting needs:

3. Quality:

4. Priority in face of competing needs:

5. Adequacy of experimental design:

B. Need for Program

1. Number of people applicable to:

2. Intensity of need of appropriate participants:

3. Projected demand for program at other institutions:

4. Projected support for program (source):

Global Effectiveness of Program

1. Short term changes:

2. Anticipated long term changes:

3. Goal attainment

4. Obstacles in conducting program:

5. Suggested changes if program repeated:

6. Most effective program component:

7. Least effective program component:

8. Most effective combination of components:

9. Generalizability and replicability of program:

10. Dissemination of materials:

11. Comments:

APPENDIX B

PARTICIPANT IMPACT SURVEY AND SAMPLE COVER LETTER

COLORADO SEMINARY
UNIVERSITY OF DENVER
DENVER RESEARCH INSTITUTE
UNIVERSITY PARK • DENVER, COLORADO 80210

Industrial Economics Division

June 9, 1976

xxxxx
xxxxx
xxxxx

Dear Ms. :

In the summer of 1974 you participated in Summer Engineering for Women at the University of Oklahoma. That project was funded as part of an experimental program. The Denver Research Institute is conducting a study to examine the impact of these projects, and to recommend the kinds of projects that best serve to encourage women to choose math, science or engineering as a career.

We would appreciate it if you could take a minute to fill out the enclosed postcard to help us in our efforts to recommend the most effective projects for women.

Sincerely,

Alma Lantz, Ph.D.
Research Psychologist
Industrial Economics Division

Enclosure

PROJECT NAME	YES	NO
1. I am now taking a math or science class . . .	[ ]	[ ]
I most likely would have without program. . .	[ ]	[ ]
2. I am now planning on a career in math/science	[ ]	[ ]
I most likely would have without program. . .	[ ]	[ ]
3. I am now planning on a different career as a result of the program	[ ]	[ ]

4. The most positive aspects of the program were:

5. The less influential aspects of the program were:

APPENDIX C

SELECTED EXISTING ALTERNATIVE CAREER PROGRAMS FOR WOMEN

APPENDIX C

SELECTED EXISTING ALTERNATIVE CAREER PROGRAMS FOR WOMEN

Special Programs for Women

The Women's Center
Barnard College
606 W. 120th Street
New York, NY 10027
Contact: Jane Gould
212/280-2067

The Women's Center at Barnard College devotes itself to reaffirming the dignity, autonomy, and equality of women. The Women's Center hopes to contribute to the dialog about the problems, the place, and the potential of women in contemporary life; to help

develop new bonds between a college and women away from college; and to give fresh insight for undergraduates about what it means to be a woman in modern times. They maintain resource materials for the students on options and the various careers available to them.

Wider Opportunities for Women Center
1649 K Street, 4th Floor
Washington, D.C. 20006
Contact: Nancy Rigby, Betsy Cooley
202/638-4868

Formerly called the Washington Opportunities for Women Center, this women's center has been in existence for ten years as an information and career counseling center. They have recently begun publication of Women's Work, with which they are expanding their services to provide sources for practical news and ideas about job realities for women. The main thrust of the Center is toward job counseling and training aimed at integrating women into the workforce more equitably. The Center provides job counseling for professional women and has extensive programs enabling women to obtain vocational job training and placement in both traditional and non-traditional fields. In these programs, they not only help obtain training and placement, but also help to sensitize supervisors, management, fellow workers and the women themselves to what they can expect especially with women in non-traditional careers. The Center is presently trying to organize a coalition of similar programs across the country to share and exchange information and resources.

Business and Professional Women's Foundation (BPW)
2012 Massachusetts Ave., N.W.
Washington, D.C. 20036

BPW Foundation will start a revolving loan fund for women engineering students to assist women in obtaining graduate engineering degrees. This program was announced recently by the Business and Professional Women's Foundation. The Exxon Education Foundation made a $100,000 grant to the Foundation to assist in starting the program. "Only one percent of the professional engineers in this country are women," said Maxine R. Hays, President of the BPW Foundation Trustees. "Women are only five percent of the enrollment in engineering degree programs. The BPW Foundation is encouraging more women to become engineers and one important way that this can be accomplished is to make financial assistance available." Loans amounting to $70,000 annually will be made to women accepted for masters' level study at universities accredited by the Engineers Council for Professional Development. Working with the Society of Women Engineers,

the BPW Foundation will distribute information about the loan program to engineering schools and women who are presently employed in engineering fields or who are undergraduate engineering students. A selection committee to review applicants for engineering study loans will include representation from the Foundation, the Society of Women Engineers and the general public. Loans up to $2,000 for one year will be granted.

Women's International Information and Communication Service (ISIS)
Via della Pelliccia 31
00153 Rome, Italy
Contact: Judy Sidden
ISIS
1915 Glenwood Ave.
Raleigh, NC 27608

A new Women's International Information and Communication Service has been organized to serve the world-wide feminist community. The four primary goals of ISIS are information dissemination and documentation, information organization, continued dialogue about women's issues on an international basis and coordination and co-operation among women on projects of an international concern. The work tasks are viewed in two main categories--information organization and dissemination and the development of communication networks among women. Among the proposal planners and endorsers of ISIS are Brigalia Bam, head of the Women's Desk, Unit III, World Council of Churches; Sylvia Talbot, Episcopal Supervisor, African Methodist Episcopal Church; Jessie Bernard, sociologist, National Institute of Education; Robert Cramer, Director of Resources for Communication and Elise Boulding, sociologist, Institute of Behavioral Science, University of Colorado.

Women Doing Research
American Psychological Association (APA)
Workshop conducted by Committee on Women in Research
Susan Sacks, Barnard College
Reesa Vaughter, Fordham University

This APA workshop was designed to communicate and utilize each participant's resources, and attempted to share expertise, ideas and strategies. Participants in the workshop articulated barriers to research achievement and strategies for overcoming those barriers. The purposes of the workshop were to (1) identify internal (psychological) and external (institutional and social) barriers to the productivity, achievement, personal satisfaction, and professional development of women researchers; (2) to exchange information concerning developed strategies which are effective

against these barriers; (3) to initiate a network of communication among women researchers; and (4) to communicate participant recommendations and suggestions for action.

Introduction to Engineering Program for High School Girls
College of Engineering
University of Wisconsin
Madison, Wisconsin 53706
CONTACT: Lois B. Greenfield
608/262-2473

The Introduction to Engineering Program for High School Girls is a summer program "designed to introduce qualified high school women to facets of the engineering profession and to encourage them to consider engineering as a career." Eligibility for the program requires three years of high school, two years of high school math, one year of science beyond general science, and academic standing in the upper 20 percent of the student's class. Applicants who had a great deal of knowledge about engineering through participation in similar programs were not generally accepted into the program.

The program involves a one-week in-residence introduction to the specific fields of engineering offered by the college. This introduction took the form of lectures and tours of facilities by members of the college facilty, and literature pertinent to the specific fields. Extensive use was made of realistic role models and hands-on experiences. (The women were able to program a computer, make castings in the foundry, etc.)

Extensive background information was taken on each woman and questionnaires were filled out by the students both before and after the course. An attempt was made to determine the significant factors in creating an awareness of or an interest in science fields, not only within the program but also in the student's home or school environment.

Suggestions from participants for improving the program included having more tours and demonstrations; having more "doing" experiences, as opposed to passive listening; involving engineering students more actively in the presentations; and encouraging speakers to communicate more at the level of the participants so they may be more easily understood.

The program's evaluation "tends to indicate that for these select young women, a program such as this is influential in helping young women choose an engineering career."

Operating funds for the program are supplied by the University ($25 per student) and each participant contributes $25 toward dormitory housing and meals for the week.

Math for Girls
Lawrence Hall of Science
University of California
Berkeley, California 94720
CONTACT: Nancy Kreinberg
415/642-4193

Math for Girls is a program involving eight-week tuition courses with the purpose of introducing girls to hands-on experiences in logical thinking and problem solving to stimulate their curiosity and interest in mathematics. Puzzles, games and computer activities show a side of mathematics that can be fun as well as challenging.

Stimulus for the program came from the low enrollment of female students in the Hall's classes in physical and life science, computer science and mathematics. The courses are taught by female students at the University who are enrolled in mathematics and computer science. They are selected and trained on the basis of their interest and ability in mathematics, and their desire to act as role models of women in mathematics for their students.

Throughout the course, time is set aside for discussion of girls' competency and interest in science and mathematics, and the stereotypic attitudes that can result in limited career expectations for women. The importance of electing science and mathematics courses in high school is stressed, since avoidance of such courses severely restricts an individual's choice of college major.

The program is still experimental and does not as yet have an evaluation process built in. Presently, they have no funding outside the University, but are seeking such funding to enable them to not only evaluate effectiveness but also bring Math for Girls to the larger Bay Area community by providing after-school workshops in selected areas.

Simmons College
Boston, Massachusetts
CONTACT: Ann Bryant
617/238-0410

Simmons College has a program funded by a large grant from the Carnegie Foundation for women employed in the banking industry. This program is directed toward women who do not have B.A. degrees and is designed to teach management principles and give them skills needed to succeed in the banking industry. The course consists of weekend seminars leading to a B.A. degree.

Project Equality--Expanding the Occupational Perceptions of Girls
Highline School District #401
15675 Ambaum Boulevard Southwest
Seattle, Washington 98166
CONTACT: LaRae Glennon
206/433-2365

The goal of this program, which deals with both secondary and primary students, is to expand the occupational perceptions of girls. Their objectives in attaining this goal include developing occupational simulations for the primary grades (to demonstrate both sex's abilities to perform these occupations); career exploration experiences, including speakers and simulation experiences, for girls in the secondary grades; developing packets of activities which suggest practical techniques of countering sex-stereotyping (role playing, role reversal); and developing a bibliography of nonsex biased and female role model books.

The program has evaluation instruments designed to assess perceptions of occupational opportunities available (with regard to sex) and indications of sex-role stereotyping. Five different instruments were used to evaluate the programs of five grade levels.

Evaluation of the primary and secondary level programs showed that significant gains were made in expanding student's perceptions of occupational opportunities available to females and a reduction in instances of sex-role stereotyping. Additionally, initial evaluation results of secondary level programs suggest an increased knowledge of the participation of females in society.

The project's first year was funded for over $70,000 by the State of Washington under Title III of the Elementary and Secondary Education Act of 1965.

Department of Mathematics and
Computer Science
Mills College
Oakland, California 94613
Contact: Lenore Blum
415/632-2700

This program, which is funded in part by the San Francisco Foundation, was begun in order to increase mathematical and technical expertise of women in many fields. A key feature is to provide easy access into the mathematics program at Mills College. Their methods include stimulating interest by weekly seminar series featuring invited speakers (predominantly women); redesigning math courses so that those with only limited high school background would not be deterred; designing a network of workshops to deal with additional student needs and to provide a variety of entrance points to the program; providing early career experiences; and increasing awareness of career options.

Evaluation of long-term effects is anticipated but not yet started.

Women and Careers in Traditionally Male Fields
Institute of Technology
University of Minnesota
Minneapolis, Minnesota 55455
Contact: Sandra Davis
612/373-2851

This two-year-old program offers a credit course to meet the needs of women entering traditionally male career fields, including engineering, medicine, dentistry, veterinary medicine, architecture, mathematics, computer science and law. The program makes extensive use of role models allowing participants the opportunity to listen to professional women's experiences and asking them questions of what life, pay, and work is like in professional careers. In choosing role models, the program looks for diversity of life styles and occupations as well as age.

The program as yet does not have a formal evaluation, but in terms of numbers of women students enrolling in the Institute, the program appears to have had an impact as the number has almost doubled.

Catalyst
14 East 60th Street
New York, New York 10022
CONTACT: Miriam Krohn
212/759-9700

Catalyst is a national nonprofit organization which develops and expands career options primarily for college-education women, with some programs for undergraduate women and women re-entering the work force. The group provides career information and self-guidance material; helps the employed woman respond effectively to opportunities for upward mobility; assists employers with the recruitment, assimilation and upward mobility of women; interprets the needs of the marketplace and offers services to equip women to meet those needs; and maintains information for referral to a national network of resource centers for women. They also publish the National Roster monthly. This roster is a computerized listing of professional women seeking employment and is distributed to employers nationwide.

Options for Women, Inc.
8419 Germantown Avenue
Philadelphia, Pennsylvania 19118
CONTACT: Marcia Kleiman
215/242-4955

Options for Women is a nonprofit corporation consultation service for women seeking to expand their career options. Modest fees are charged to cover their operating expenses and vary according to the service.

Their purpose is to aid women in defining and clarifying their career goals and explore the options available to them; they also help the community consider alternative career patterns, recognize the varied abilities of women, and create more varied opportunities for women.

The program includes individual and group consultations, vocational interest and aptitude tests, a resource library, a placement service, and a consulting service to aid employers and institutions in issues dealing with issues regarding the hiring and promotion of women.

Maple Heights Equity Career Education Program
Maple Heights City Schools
5500 Clement Drive
Maple Heights, Ohio 44137
CONTACT: Marilyn Hormann
216/587-3200, Ext. 200

The objectives of this program are to give learners in grades K through 10 an increased knowledge of careers so that they may make more informed decisions, and make students (especially female) more aware of equity and the fact that existing sex bias and sex stereotyping limit career choices and career goals, so they will be challenged to consider alternative roles and career models.

The program utilizes classroom activities, as well as activities with parents, the community, and business and labor leaders.

An evaluation (by consultants) will be completed by May 1976 and will determine the change in student's attitudes toward career choices and goals. The program has been funded by a $131,000 grant.

Sandia Laboratories
Albuquerque, New Mexico 87115
Contact: Charles E. Cockelreas
505/264-1130

Sandia Laboratories, a prime contractor to the U.S. Energy Research and Development Administration, has produced three films on science and engineering. The first two films dealt with Chicano and Indian Ph.D.'s in science and engineering. The third film is the first in a series of 6-8 films about women in science and engineering. The first of this series is . . .keep the door open. This film and the rest of the series have the goal of encouraging young women to consider careers in science and engineering and are directed toward junior high school girls. The thrust of all the films will be to provide role models that counteract existing stereotypes. Interviews were conducted throughout the country to find articulate women of varying physical and intellectual types. Although the films obstensibly deal with the professional side of science and engineering careers, there is also considerable discussion about the kinds of problems the women faced as girls growing up in a traditionally conservative culture.

APPENDIX D

FILM BIBLIOGRAPHY

FILM BIBLIOGRAPHY

Title: And Who Are You?
30 minutes, 16mm, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Hubert S. Coffey and Marya Mannes discuss discovery of one's inner self and the possible conflicts in maintaining one's individuality. One of the series, Choice: Challenge for Modern Woman.

Title: Choice Chance Woman Dance
44 minutes, color, 1972
Filmmaker: Ed Emshwiller
Description: Purports to "tackle the dilemmas, paradoxes, and choices available to the middle class woman today . . ."

Title: Girls and Women
A series of 10 programs of 30 minutes each
Filmmakers: Selma Odom and Margo Shackson
Producer: The University Television Center
Description: A series which focuses on the physical and sociological differences between the sexes, the psychology of women, variations of life styles, women's place in history, stereotypes of women and women's rights.

Title: Is Personal Growth Selfish?
30 minutes, 16mm, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Sister Mary Corita, and Anne Steinmann discuss women's growth throughout life, their dependency upon male and societal attitudes, and opportunities with "the system." One of the series, Choice: Challenge for Modern Woman.

Title: Margaret Mead
30 minutes, B/W, 1960, #6930
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Celebrated anthropologist brings the experience and understanding gained from her study of primitive cultures to a lively discussion of contemporary world problems--marriage and morality, the place of women in modern life, the education of young people, etc.

Title: Woman's Place?
30 minutes, 16mm, B/W
Source: American Association of University Women/2401 Virginia Avenue, N.W./Washington, DC 20036/phone 202-338-4300
Description: AAUW panel discussion by six women on the status of women.

Title: A Woman's Place
A weekly program series on WTTW Ch. 11. Production started in February 1972, and broadcasting began shortly thereafter.
Description: Focuses on the changing role of women in today's world. The program is designed as an open forum for the exploration and discussion of the full spectrum of viewpoints concerning women's issues.

Title: 51%
30 minutes, 16mm, color, 1971
Directed by Dick Feldmen, produced by Rob't Drucker & Co.
Source: Sheldon Satin Films/1175 York Avenue/New York City, NY 10021
Description: Three case studies of women employees in a corporation spotlight stereotypes about and discrimination against women. Provides good role-model examples for women dealing with difficult situations.

*Title: Help Wanted - Women Need Apply
61 slides with script
Source: Jim Farron/Dallas Regional Office/Civil Service Commission/ Dallas, TX
Description: Designed to be shown to high school and college classes and women's clubs, the film describes and shows women in a variety of jobs--flood control engineer, attorney, chemist, accountant, radio equipment installer and repairer, photographer, and others.

Title: Job Interview - Three Young Women
17 minutes, B/W, 1968
Source: Business Education Films/5113 16th Avenue/Brooklyn, NY 11204
Description: Three young women are interviewed for a job. The discussion centers on mistakes they make during the interview for a job, and how to correct them.

Title: Never Underestimate the Power of a Woman
20 minutes
Source: Norma Briggs/Department of Apprenticeship Training/ 310 Price Place/Department of Labor, Industry and Human Relations/ Madison, WI
Description: A film showing women performing well in so-called male occupations.

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*Films dealing specifically with women in science.

Title: Modern Women: The Uneasy Life
55 minutes, 16mm, B/W, 1965
Source: University of Indiana
Description: Faces with candor--the feelings of both women and men regarding the traditional role of women. The new freedom involves multiple choices which create anxieties. Participants include young married women, college women, career women.

Title: What Is A Woman?
30 minutes, 16mm, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Keith Berwick and Margaret Mead discuss what is feminine and masculine, as prescribed by society and confused by changing patterns. One of the series, Choice: Challenge for Modern Woman.

Title: What Is The Shape Of Tomorrow?
30 minutes, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Jeanne Noble and Rabbi Alfred Gottschalk discuss variation in personal standards, beliefs, and values; spiritual, moral and interpersonal sources of strength; and women's power in shaping the world of tomorrow. One of the series, Choice: Challenge for Modern Woman.

Title: Who Wants Freedom?
30 minutes, 16mm, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Elisabeth Mann Borgese and Richard Lichtman discuss the meaning and consequence of "freedom" . . . how much self-determination and in what areas of life? One of the series, Choice: Challenge for Modern Woman.

Title: Woman Is
27 minutes, color, 1969
Producer and Source: American Standard Association/10 E. 40th Street/ New York City, NY 10016
Description: Examines the personal philosophy of the woman in today's world and shows her in some of her many roles, as an enigma, a philosopher and a romantic.

*Title: . . . keep the door open
19 minutes, 16mm, color
Filmmaker: Charles E. Cockelreas
Source: Motion Picture Production Division-3153/Sandia Laboratories/ Box 5800/Albuquerque, NM 87115
Description: Film designed to encourage young women to "keep the door open" on career options and to consider non-traditional careers, especially math and science. Discussions of life and work with numerous professional women involved in non-traditional careers.

Title: New Careers for Women
17 minutes, color
Source: American Educational Films/331 North Maple Drive/ Beverly Hills, CA 90210
Description: Restructuring of the roles between the sexes will be illustrated in a discussion of the new family and the role which the creative working woman will have in the world of the future.

Title: Wages of Work
30 minutes, 16mm, B/W
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Mary Keyserling and a panel of employment experts discuss why, how, when, and where women work, and effects on family, job, and community. One of the series, Choice: Challenge for Modern Woman.

Title: What's The Matter W'th Alice?
30 minutes, 16mm, color, 1972
Source: Newsfilms, USA/21 West 46th Street/New York City, NY
Description: Prepared for the Civil Service Commission, the film communicates an understanding of "upward mobility."

Title: The X-Factor: Women As People
30 minutes each (one inch video-tape)
Source: Cornell University/Director ETV Center/Van Rensselaer Hall/ Ithaca, NY 14850
Description: Two half-hour programs on the status and image of women, developed for a course at Cornell.

Title: Childcare: People's Liberation
20 minutes, 16mm
Source: San Francisco Newsreel/Department W/1232 Market Street/ Room 101/San Francisco, CA 94102
Description: This film reviews how mothers and children in this society tie each other down. It shows, through examples, how community-run childcare centers are a step toward liberation.

Title: Who is Sylvia?
27 minutes, B/W, 1957, #4793
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Study of the dreams, fears and hopes of a 14 year old girl, "half child, half woman" and of her relationships with her family, school and friends.

Title: Teach Your Children Well
30 minutes, 16mm, color
Producer: Marta Ashley; Assoc. producer: Nina Janowsky; Assistant: Marty Coe
Source: Femedia/2286 Great Highway/San Francisco, CA 94116
Description: Documentary about three women: a Black, a Chicana, and a white woman in a comparison of how their parents educated them and how the consequences of this affects them today.

Title: Choice: Challenge for Modern Women
series of 12 films each 30 minutes, B/W, 16mm, 1967
Source: University of California/Extension Media Center/Berkeley, CA 94720
Description: Twelve discussion programs designed to help women arrive at reasoned choices as they make decisions affecting themselves, their families, and society.

Title: Anything You Want To Be
8 minutes, 16mm, B/W
Filmmaker: Liane Brandon
Source: New Day Films/267 West 25th Street/New York City, NY 10001
Description: The conflicts and absurdities that beset a high school girl. She mimics female stereotypes: the wordly sophisticate, the wholesome homemaker, the sexy "chick," the sweet young thing. The film raises questions and provokes thought rather than prescribing answers.

Title: Evolving Toward Woman
60 minutes
Source: Contact Deidre Walsh, c/o The Feminist Voice for more information
Producer: Deidre Walsh
Description: The struggle of women to redefine themselves in the midst of the changes that are happening in our culture. It presents an introduction to the issues, rather than narrowing in on one specific issue. It includes rap sessions, interviews, and scenes of everyday occurrences.

Title: Growing Up Female: As Six Become One
60 minutes, 16mm, B/W
Filmmakers: Julia Reichert & James Klein
Source: New Day Films/267 West 25th Street/New York City, NY 10001; or from San Francisco Newsreel/Department W/1232 Market Street/Room 101/San Francisco, CA 94102
Description: A documentary on the socialization of women in America. The film traces this process through the lives of six females; the youngest is 4, the oldest is 35. In between, the women are students and workers, white and black. A powerful film.

Title: Woman, Wife Or What
29 minutes, 16mm, B/W
Producer and Source: KUON-TV Univ. Ed. TV Station/1600 R Street/ Lincoln, NE 68508
Description: Explains that in a modern world, many modern women have feelings of being trapped, their role confused. Describes the battle for intellectual recognition and need for creative achievement.

*Title: To Be A Woman
13 minutes, 16mm, color
Source: Billy Budd Films/235 East 57th Street/New York City, NY 10022
Description: Designed as a tool to trigger re-thinking and start discussion. Girls and young women were interviewed and 18 hours of feminine voices speaking of themselves, their self-image, their attitudes, their conviction, and themselves were collected. The best statements were put into 6 sections: girlhood, personhood, feminity, anti-stereotypes, sexuality and idealism.

*Title: Women's Work: Engineering
26 minutes
Source: Massachusetts Institute of Technology/Center for Advanced Engineering Study/Cambridge, Massachusetts
Description: Designed for use by secondary school students in science, math, social studies, and career education classes. The film is intended to provide in-depth portraits of women students and professionals, giving their personal views about the opportunities, problems, and rewards of an engineering career.

*Title: Women in Science
Source: Queensborough Community College/Bayside, New York 11364
Description: This is a multimedia package containing cassette interviews, slides and articles plus references, showing the work and lifestyles of six successful contemporary female scientists. Designed for use by young women making educational and career choices.

Title: A World for Women in Engineering
Filmmaker: Bell Telephone
Source: Bell Telephone Companies/Available Fall 1976
Description: A film designed to encourage young women to consider engineering as a career. Six women engineers from Bell Labs talk about their experiences in engineering.

We understand that a number of promotional films dealing with women in science are being produced privately by various companies, including General Electric and Kodak; however, we have been unsuccessful in our attempts to locate these films, or their titles.

APPENDIX E

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BIBLIOGRAPHY

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APPENDIX F

SELECTED ANNOTATED BIBLIOGRAPHY

American Association of University Women Educational Foundation. Counseling Techniques for Mature Women. Washington, D.C., author, 1966. 290 p.

Report of a pilot adult counselor program, directed by Eleanor F. Dolan under contract with the Office of Manpower, U.S. Department of Labor. The consultants and participants in this program became convinced that counselors must have knowledge of adult women's psychology, information about the educational resources available, knowledge of the techniques of counseling, and information about the current job market. Women returning to work are insecure, unable to "piece together" help. They need a relationship with one person who can help them work out the basic steps. A full report, with an appendix of 158 pages containing suggested readings, syllabi, course outlines, and case histories.

An Imperative for the Seventies: Releasing Creative Womanpower: A Guide for Counselors of Mature Women. University of Missouri—St. Louis, Extension Division, 1969. 31 p.

Proceedings of a summer workshop sponsored by the University of Missouri—St. Louis, Lindenwood College and the National Association of Women Deans and Counselors. The purpose of the workshop was the exploration of the societal attitudes and emerging options for the education and employment of women in the seventies. Papers by Esther Westervelt, Gladys Harbeson, Carole Leland and Ruth Van Doren are included. A schematic cycle of the educational process for identifying, planning, implementing and evaluating programs for women, and delineation of potential target populations of women by King M. Wientge is also included.

Astin, Helen S. and Thelma Myint. "Career Development of Young Women During the Post-High School Years." Journal of Counseling Psychology, v. 18, no. 4, July 1971, p. 369-394.

This study of 5,378 women during the five year period after high school demonstrates that a certain amount of career predictability is possible. Girls who in high school score high on scholastic aptitude, especially in mathematics and who plan to go to college, usually choose fields that require greater career commitment. Plans to do office work or to be a housewife are made by girls with less aptitude and fewer academic interests. Girls who are interested in social service or health fields, but have little interest in further education usually continue to choose these fields. Full-time employment after high school, and early interest in business and management, a B.A. degree, and unmarried status proved to be the best predictors of plans to pursue a business career.

Despite the fact that close to one-half of the women studied changed their career plans during the period studied, early pattern

and interests predict later career outcomes. Since many women must decide at high school graduation about future careers, counselors and educators should assume responsibility for guiding these young women to make plans most appropriate for them, especially those planning careers that require specialized training. Guidance becomes even more crucial for those girls of high ability and low aspirations who later learn that office work or being a housewife is not commensurate with their interests or abilities.

Bank, Ira M. "Children Explore Careerland through Vocational Role-Models." Vocational Guidance Quarterly, v. 17, no. 4, June 1969, p. 284-289.

The author feels that boys and girls in elementary schools are in need of experiences which can provide maximal opportunity for vocational inquiry. A broader base for vocational choice can be developed during those formative years and counselors can help build an expanded "career-land" in which the children are exposed to the world of work and workers at an early age. The individual's choice of alternatives in his future years may be enhanced by this exposure. The author describes a role-model program which was used in an elementary school and evaluates it.

Cook, Barbara. "Roles, Labels, Stereotypes: A Counselor's Challenge." Journal of the National Association of Women Deans and Counselors, v. 34, no. 3, Spring 1971, p. 99-105.

The author discusses answers to the questions: what should it mean to a counselor to have an increased awareness of culturally defined roles for men and women? How may a counselor increase her own awareness? How does a counselor's self concept affect her ability to help individual women find answers to their individual problems?

Daly, Edith M. A Theory for the Vocational Counseling of Women. Doctoral Dissertation, Ohio University, 1970. 199 p. (University Microfilm Publications No. 71-16, 483)

A study designed to develop a conceptual framework for viewing the complexities of female occupational choice and suggesting a vocational counseling process. Literature of the past ten years was reviewed. It appears, says the author, that objective knowledge of individual traits and/or of factors operative in job situations does not explain women's vocational choice processes. Research findings seem to point to what could be called a "situational" view of women's choices. The decisions women make about career patterns and specific occupations are made in the light of their own individual priorities, at a particular point in time, in relation to their perception of the meaning of a number of variables impinging upon and within them. The author discusses her theory for counseling.

Entine, Alan D. "At Mid-Life They Return to College and Change Careers." Journal of College Placement, v. 27, no. 4, April-May 1967, p. 50-57.

The director of the pilot New Careers Program at Columbia University discusses the program, and the motivations of people wishing to change careers at mid-life. He feels that the national interest in this program has "uncovered a finding broader than the original scope of the program--countless men and women wish to change their careers in the middle years."

Eyde, Lorraine. "Eliminating Barriers to Career Development of Women." Personnel and Guidance Journal, v. 49, no. 1, Sept. 1970, p. 24-28.

Women and girls need special assistance in planning careers, and vocational counselors need to consider carefully factors in their background and patterns of development, according to author. The needs of low income group women, for example, are different from those of other groups. Counseling young girls requires covering far more than traditional topics of vocational interest and aptitudes. Counselors as a whole, the author states, have been found to hold sex-stereotypes, and they need to change these attitudes. They also need to be aware of subtle changes occurring in occupations so that they can prepare women for the future instead of the past.

Fagin, Margaret C. "Analysis of the Performance of Adult Women in Missouri on Three General Examinations of the College Level Examination Program." Adult Education Journal, v. 21, no. 3, Spring 1971, p. 148-165.

One of the major purposes of the College Level Examination Program is to give adults an opportunity to secure college credit by examination. In 1967-68, three of the General Examinations of the College Level Examination were administered to 319 Missouri women, aged 25 to 73, for the purpose of comparing their test performances with those of regularly enrolled freshman and sophomore college women, and of developing normative data for adult women. Among the 10 findings listed: chronological age has no bearing on the ability of mature women to perform well on the three examinations used; recency of formal education is significantly related only to performance on the Natural Sciences Examination; level of formal education is significantly related to all three examinations. These and other findings have important implications for counselors of adults, college admissions officers and employers of mature women.

Farmer, Helen S. and Martin J. Bohn, Jr. "Home-Career Conflict Reduction and the Level of Career Interest in Women." Journal of Counseling Psychology, v. 17, no. 3, May 1970, p. 228-232.

Many women experience conflict between home and career because of the cultural lag between social opportunity and social sanction. This study was an attempt to reduce home-career conflict experimentally,

by providing a measure of social sanction for demanding career roles and to measure the effect of this reduction on home and career interests. In addition, the study controlled for married/single status to determine its relevance to vocational interest when home-career conflict was reduced. It was concluded that the level of vocational interest in women, irrespective of married/single status would be raised if home-career conflict were reduced. Women's attitudes toward careers can be affected and counselors must take time to discuss some of the issues involved in the vocational choice process for women. Such clarification could be built into high school and college curricula for girls, "warranted when one considers the gain to society if women chose careers commensurate with their potential."

Fortner, Mildred L. "Vocational Choices of High School Girls: Can They Be Predicted?" Vocational Guidance Quarterly, v. 18, no. 3, March 1970, p. 203-206.

Although counselors are becoming aware of the changing patterns in labor force participation of women and the need to help girls prepare for the future, they have difficulty doing this because of lack of knowledge of factors contributing to the vocational choice of girls. This study attempts to identify some of these factors, using IQ scores, Sims Occupational Rating scale, social class and family wage earners' occupations, on a group of 400 high school juniors and seniors in Missouri and Wyoming. Results show predictions can be made.

Friedersdorf, Nancy Wheeler. A Comparative Study of Counselor Attitudes Toward the Further Educational and Vocational Plans of High School Girls. Doctoral dissertation, Purdue University, 1969. 171 p. (University Microfilm Publications no. 70-3887)

An attempt to determine the attitudes of counselors toward the educational and vocational goals of high school girls, and the extent of difference between male and female counselors. The counselors were compared in a role-playing situation where they acted as college bound high school girls and non-college bound girls. The counselors were also given the Strong Vocational Interest Blank and Personal Information Forms to complete. Some conclusions: male counselors associated college bound girls with traditional feminine occupations at semi-skilled levels, and tended to think of women in feminine roles; female counselors tended to expand the traditional image of female work roles; male counselors perceived the college bound girl as having positive attitudes toward traditionally feminine occupations regardless of the classification level of the occupation. Such perceptions may affect the higher educational and vocational goals of the female student. Recommendations and suggestions for public school programs to expand occupational horizons for women are presented.

Gardner, Joann. "Sexist Counseling Must Stop." Personnel and Guidance Journal, v. 49, no. 9, May 1971, p. 705-714.

The author states "Today, it is probably not a serious misrepresentation to say that all counselors are sexist." The myths about women need to be eliminated and texts and curricula from prereading on need revision so that children will develop aspirations according to their individual characteristics rather than to their sex. She suggests that counselors must take courses taught by feminists, participate in consciousness-raising groups, and pursue internships supervised by feminists.

Hall, Guin. "A New Look at Women and Vocations." American Vocational Journal, v. 39, no. 4, April 1964, p. 25.

The author contends that education has a responsibility to the girl in school and to the women wishing to re-enter the job market. Vocational schools might explore job orientation courses and women's organizations might sponsor job clinics where free guidance by career specialists could be given. There is also a need for educators, especially vocational teachers, to meet more frequently with business and industry personnel, and employment agency personnel.

Johnson, Ray W. "Parental Identification and Vocational Interests of College Women." Measurement and Evaluation in Guidance, v. 3, no. 3, Fall 1970, p. 147-151.

The subjects in this study were tested for occupational interests and identification with mother or father. From the results it would seem that women with interests in areas that are basically scientific tend to identify more with their fathers than their mothers. The results further suggest that identification with the mother, as measured by the technique of this study, is not a major consideration in the formation of the sex-typical occupational interests. Career interests are not necessarily associated with masculine identification but mathematical-scientific interests may be so associated.

Levine, Adeline Gordon. Marital and Occupational Plans of Women in Professional Schools: Law, Medicine, Nursing, Teaching. Doctoral dissertation, Yale University, 1968. 139 p. (University Microfilm Publications no. 69-13, 353)

Social class, background factors, future plans and current experiences of students at four professional schools were studied. Two of the schools (law, medicine) were characterized as masculine fields, the other two as feminine. It was found that women in the masculine field schools came from higher social class backgrounds, and had mothers who were better educated and approved of a variety of career roles for women. These findings were interpreted as showing that not only the financial resources to implement career choices, but models of orientation toward female occupational and educational roles differed between career field groups.

Lewis, Edwin C. Developing Women's Potential. Ames, Iowa, Iowa State University, 1968. 389 p.

A survey of existing research on women, including ability, education, employment, careers and guidance. The author summarizes the research which is frequently conflicting. An extensive bibliography is included.

McHugh, William Thomas. A Study of the Differences in Self-Concept and Occupational Role Concepts of Young Women and Middle-Aged Women In Occupational Training Programs. Doctoral dissertation, University of Oregon, 1970. 96 p. (University Microfilm Publications no. 71-1333)

The theory that an individual uses her occupational choice as a means of self-actualization was the position of this study. The study investigates the effects of age on the relationships between self-concept and occupational role concepts. The analyses of data in all areas of the study revealed no significant differences between the middle-aged women and younger women of this study, who were in the final stages of professional and semi-professional training at an urban community college. If, however, the directional pattern of the differences in mean scores are not due to chance, then some conclusions can be proposed. The author discusses these.

MacPherson, Lucille I. The Effects of Social Class on Females' Perceptions of Traditional Sex Role Adherence in Occupations. Doctoral Dissertation, Arizona State University, 1971. 82 p. (University Microfilm Publications no. 71-5981)

The premise of this thesis is that social class membership influences perceptions of traditional sex-role adherence in occupations and these perceptions in turn affect occupational choice. The analysis revealed significant differences between the responses of the high school seniors in three social classes for semi-professional, managerial, skilled, and semi-skilled occupations. Sex role adherence appeared to be a function of social class membership. To the extent that this population studied is representative of female high school seniors, it can be concluded that social class is an important factor influencing perceptions of sex role stereotypes in occupations. These findings help toward a better understanding of some factors involved in girls' occupational decision making and subsequent development of a theory of vocational choice for women.

Masih, Lalit K. "Career Saliency and Its Relation to Certain Needs, Interests, and Job Values." Personnel and Guidance Journal, v. 45, no. 7, March 1967, p. 653-658.

The high career-salient woman, according to this study, shows a high need for achievement and perceives herself as capable of enduring long periods of work. She indicates a strong desire for fame but is less concerned with prestige. However, this is a small portion of

the women tested and compared to men, a much smaller proportion. According to the author "the recognition of these differences is essential for any successful counseling program . . . a program more oriented toward nonoccupational interests and motivations might go a long way in clarifying the goals of women."

Matthews, Esther and David V. Tiedeman. "Attitudes Toward Career and Marriage and the Development of Life Style in Young Women." Journal of Counseling Psychology, v. 11, no. 4, Winter 1964, p. 375-384.

A study of 1237 girls, representing the developmental stages of early adolescence, adolescence and young adulthood and their attitudes toward career and marriage. One interesting finding is the drop in career commitment from junior to senior high school. The high school group showed a greater acceptance of marriage. The authors feel that a major theme which appeared in the responses is that women feel that men take a dim view of the expression of women's intelligence, and it is therefore wise to accept this situation if one wishes to marry.

Mooney, Robert Francis. A Multiple Discriminant Analysis of the Interest Patterns of High School Girls. Doctoral dissertation, Boston College, 1968. 147 p. (University Microfilm Publications no. 69-12, 329)

This study attempted to discover if significant differences exist among college preparatory high school girls categorized into broad occupational preference groups. It also attempted to examine the nature of any differences and classify girls into occupational preference groups on the basis of these differences. Results showed that the interest patterns of many high school girls seem to crystallize by the time they enter 10th grade. It further showed, according to the author, that it was possible to classify girls, on the basis of their interest pattern into more specific occupational groups than science or non-science. The classification procedures of this study might suggest to the guidance counselor a new and effective method for helping high school girls to select appropriate careers.

Mowesian, Richard. "Educational and Career Aspirations of High School Females." Journal of the National Association of Women Deans and Counselors, v. 35, no. 2, Winter 1972, p. 65-70.

According to the author, this study implies that girls are not satisfied to enter the labor market in just any job but have definite post high school objectives as well as levels of occupational aspirations. If the data from this investigation of girls in Texas can be accepted as representational of our adolescent female population, then there are some implications that counselors will need to consider in career planning with the girls. The author lists and briefly discusses four considerations.

New Patterns of Employment. Proceedings of the Conference-Workshop, March 29, 1966, Center for Continuing Education of Women. Ann Arbor, Mich., University of Michigan, 1966. 143 p.

Many women wish to resume their interrupted formal education, or enter new fields, but they want to be trained in a field where their services will be needed. The emphasis of this conference is to discover the most promising fields of employment for the educated mature women who want to work only a twenty to thirty hour week because of family responsibilities.

Ohlsen, Merle M. "Vocational Counseling for Girls and Women." Vocational Guidance Quarterly, v. 17, no. 2, Dec. 1968, p. 124-127.

Because society's influence has not encouraged girls to take seriously the choice of an out-of-home career, the author feels that the counselor must make special efforts to cope with the sex role problems and encourage girls to enter responsible positions in business, industry and the professions.

Okun, Barbara F. "Later Careers of Women College Graduates." Journal of the National Association of Women Deans and Counselors. v. 35, no. 2, Winter 1972, p. 83-89.

Increasingly, counselors are having to deal with the problems of the extended work life of the mature woman. If more were known about the potential influences--early work, education, familial experiences--counselors would be better able to help college girls identify the kind of variables they should consider during their forthcoming career and homemaking periods. Counselors would then have a better understanding of the special considerations necessary in the study of women's occupational choices. The purpose of this study was to identify the factors that determine the occupational choices of a married women 12 to 20 years after college graduation following a period of at least seven years as a homemaker.

Rezler, Agnes G. "Characteristics of High School Girls Choosing Traditional or Pioneer Vocations." Personnel and Guidance Journal, v. 45, no. 7, March 1967, p. 659-665.

Junior and senior girls in a Catholic girls' high school in the mid-west were the subjects of this study. The characteristics of girls who wished to be pioneers, i.e., physicians, mathematicians, scientists, were compared with traditionals, i.e., nurses, elementary school teachers. Academic aptitude, interest, achievement and personality differentiated pioneers from traditional. From the results it seems clear to the author that prospective pioneers can be separated from traditionals by the time of the junior year in high school. The implications of this for counseling high school girls is discussed.

Schissel, Robert F. "Development of a Career-Orientation Scale for Women." Journal of Counseling Psychology, v. 15, no. 3, May 1968, p. 257-262.

This study developed a Career-Orientation Scale which discriminates between career and non-career oriented women on the basis of interest. The results were favorable to the hypothesis that areas of interest of women classified as "career oriented" differed significantly from those of "non-career oriented" women. There is evidence that women can be ordered along a continuum of career orientations on the basis of their interests.

Sedlacek, Carolina Gladys. Selected Factors Affecting Certainty and Persistence of Vocational Choice for College Women. Doctoral dissertation, University of North Dakota, 1968. 123 p. (University Microfilm Publications no. 69-8567)

The purpose of the study was to investigate vocational choice and persistency in relation to the college factors: type of vocational choice, vocational interest patterns, personality needs, academic ability and performance, and family background. The study was done in two steps with follow-up questionnaires. Some findings for the first part: more women from the "very certain" vocational choice and "fairly certain" groups chose traditional vocations than the "uncertain" group; the "very certain" group scored lower than the other groups on the mathematics and natural science tests. Findings of the second part revealed that by the end of the second year in college 90 percent of the women were preparing for traditional feminine vocations. Women who had been "certain" or "fairly certain" of their freshman vocational choice tended to change their vocational choice.

Stafford, Rita Lynne. "A Study of the Process of Vocational Development in Professional Women." Journal of the National Association of Women Deans and Counselors, v. 30, no. 4, Summer 1967, p. 190-192.

This study of outstanding women in New York State who had been practicing in the fields of law, medicine, dentistry, nursing and educational administration, showed that with the exception of educational administration, approximately one-fifth of the respondents "knew" prior to the age of 12 that they wanted to enter the field in which they are presently engaged. By the time they had entered college, 26 percent of the attorneys knew law was their chosen profession, 45 percent of the doctors had decided on medicine, 17 percent of the educational administrators had chosen the educational world and 19 percent of the nursing administrators had made their decisions. These results, in conjunction with tables reveal that influential persons, attitudes, and events combined with data concerning youthful career interests should cause educational institutions to re-examine their patterns of student guidance.

Steinmann, Anne. "Female Role Perception as a Factor in Counseling." Journal of the National Association of Women Deans and Counselors, v. 34, no. 1, Fall 1970, p. 27-33.

The author, who has conducted many studies on sex role concepts, states, "Irrespective of age, marital status, race, education or socio-economic status, women seem to be ambivalent with respect to home and career." Counselors must now identify this problem of girls at an early age to help them make appropriate choices in resolving it. Since counseling is now more than curricular advice and since role conflict is so prevalent, the need for early counseling in school is especially urgent. Without such help, "women are likely to experience frustration in whatever role they choose." The present study is an attempt to uncover the bases for the role-conflict by investigating a group of college women. Evidence suggests strongly that counselors must consider the potential life-style of young women clients against the background of the views and life-styles of their parents. Parents' attitudes represent both a direction and a limitation for young women. Every young woman must be helped to make an early start in assessing her own needs and measuring these needs in relation to the environment. In addition, all concerned with the need to help young women plan must continually stress the need for universal free day care. "Ultimately only this will give women the opportunity to choose freely between home and career."

Tennyson, W. Wesley, Thomas A. Soldahl, and Charlotte Mueller. The Teacher's Role in Career Development. Washington, D.C., National Vocational Guidance Association, 1965. 107 p.

Revised edition of a Minnesota Department of Education publication. According to the authors, an effective guidance program is dependent to a considerable extent on the active participation of classroom teachers. Teachers can make an important contribution in pointing out the relationship of the subjects they teach to various careers. The focus of this publication is on the methods and media for relating subject matter to vocational development.

Thomas, Arthur S. and Norman R. Stewart. "Counselor Response to Female Clients with Deviate and Conforming Goals." Journal of Counseling Psychology, v. 18, no. 4, July 1971, p. 352-357.

Counselors, along with women, are struggling with the discrepancies between stereotypes of the past and the current societal changes. This study was designed to test the response of secondary school counselors to girls who select traditional occupations and those who select what are considered masculine goals (deviate). Sixty-four counselors were tested. Results were: Female counselors were more accepting of both types of girls than male counselors; counselors, regardless of sex, rated conforming goals as more appropriate than deviating goals; counselors, regardless of sex, rated girls with deviate career goals to be more in need of counseling than those with conforming goals. Details of the study and implications are discussed.

Wolkon, Kenneth A. Prediction of Pioneer Vocational Choice in College Women. Doctoral dissertation, Boston College, 1970. 133 p. (University Microfilm Publications no. 70-22, 800)

Data for this study was gathered from alumnae of Brandeis University and Regis College, classes of 1962 and 1963, and its main purpose was to examine the legitimacy of the career-orientation of women as previously studied. Despite literature to the contrary, no significant differences were found among the groups (classified as Pioneer, Traditional and Homemaker) for mothers' work histories or either parent's educational or occupational levels. Religious factors appeared to be important in that Catholics are much more likely than Jews to be Homemakers and within the career classifications are more likely to be Traditional as opposed to Pioneers than are Jews. No significant differences could be found among the three groups related to age at marriage or the timing of decisions about college majors or careers. Pioneers tend to live in more heavily populated areas than either of the other two groups. Traditionals tended to be first born and Pioneers, second born.

Zapoleon, Marguerite W. Occupational Planning for Women. New York, Harper & Bros., 1961. 276 p.

The author states that this book is addressed primarily to those who help girls and women in their occupational planning. Vocational guidance is not examined from the viewpoint of the nation and its needs, but from the viewpoint of the individual girl or woman seeking to be useful and happy in her work. It is written in a non-technical style and deals with the problems of occupational choice, descriptions of what is being done in schools and social agencies in guidance, and technique adaptations or elements especially useful in the vocational guidance of girls and women.

Stollenwerk, Toni. Back to Work, Ladies; a Career Guide for the Mature Woman. New York, Pilot Industries, 1967. 55 p.

The author gives advice and encouragement to women who wish to return to work.